

# THE IRON AGE

THURSDAY, NOVEMBER 19, 1891.

## Early Blast Furnaces.

Jno. L. Means of Steubenville, Ohio, has furnished to the *Ohio Valley Manufacturer* the following interesting description of the first blast furnace erected west of the Allegheny Mountains:

The ruins stand in the barnyard of Mason Tarr, a descendant of one of the former operators of the furnace on King's Creek, Butler Township, Hancock County, W. Va., about seven miles northeast of Steubenville, Ohio. This furnace was erected by a man named Grant, in 1794, and operated by a company of which he was a member. They, however, shortly failed and it passed into the hands of Connell, Tarr and Wilson, in 1797, who operated it with more or less regularity until its final abandonment. All that now remains is the ruins of the jacket, and

in all directions. Many of these articles are still in possession of the descendants of the old families of that region and are very good castings, considering the difficulties under which they were made and the meager knowledge of foundry practice. Some of the cannon balls used by Commodore Perry in his great victory on Lake Erie were made here and taken to Presque Island (now Erie) by pack mules. Much of the iron in small pigs was taken to Pittsburgh in the same manner for forge purposes. In 1800 William Griffith erected a forge about one-half mile below this furnace, which was operated for a number of years, and was a large consumer of the product of this furnace. In 1884 the company then operating it failed and the fires were never rekindled. Even in those days the iron business had its ups and downs. As Virginia is the mother of

iner because he is sent from Albany rather than from Washington. The failures of national banks last year increased to nine. The entire number this year is about a score. The Comptroller of the Currency will make this a prominent topic in his forthcoming report.

## Testing Material for the Babcock & Wilcox Boilers.

The boiler maker constructs his boiler with two thoughts uppermost in his mind. He hopes that it will fall into the hands of an engineer who will consider it as a contrivance worthy of some consideration, and who will treat it with care and attention. He fears that it may be consigned to the tender mercies of a man who thinks his duty toward it done when he gives it

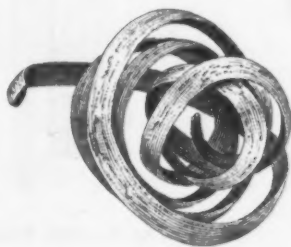


Fig. 8.—Chip Taken from Tube Sheet.

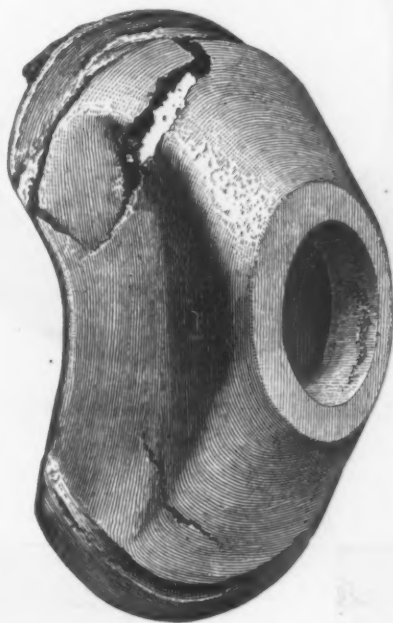


Fig. 9.—Hand-Hole Clamp.

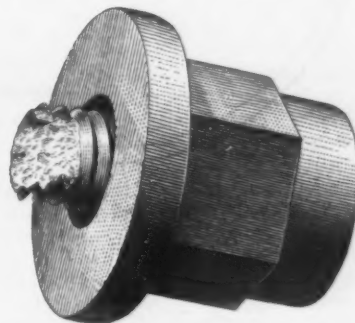


Fig. 10.—Bolt and Nut.

## TESTING MATERIAL FOR THE BABCOCK & WILCOX BOILERS.

that in a very unstable state. It was built up of sandstone and lined with soapstone, which we all know is capable of standing a most intense heat. The lining was as hard and brightly glazed the day the writer saw it, about three weeks ago, as though a heat had been made in it the day before. The iron ore was obtained in the hills of the immediate neighborhood, some of which has been used by one of the Steubenville furnaces within the last decade, but with small success, owing to its low percentage, being only 33½ per cent. pure. The furnace was blown by a bellows operated by horse power, one horse doing the work, and said to have been driven by a slave owned by the operators. It is said the furnace would average about 10 tons a week, quite a difference from the capacity of some of the furnaces now west of the Alleghenies. The territory about the furnace for quite a distance has been stripped of its wood and made into charcoal, which was the fuel in smelting. A great portion of the metal there produced was molded into skillets, kettles, grates, &c., which found a market at the furnace, the purchasers being from the sparsely settled regions for 25 miles

Presidents, can it not correctly be called the mother of the iron business in the West? This furnace was always called the Brooke Furnace, in honor of Robert Brooke, who became Governor of Virginia the year it was erected, he being Governor from 1794 to 1796.

The frequency of bank failures of late raises a question respecting the efficiency of the present system of bank supervision, both State and national authorities seeming to be at fault. A financial writer says: "Banks can be entirely wrecked under the very noses of Federal examiners; the Keystone in Philadelphia and the Maverick in Boston, for instance. And if anybody hopes that State supervision will be more effective, he is reminded that the American Loan and Trust Company had been passed as perfectly sound by State examiners only a short time before it went into insolvency. The Kingston Savings Bank had been robbed by officials for years, but repeated examinations had failed to detect the fraud, which finally came to light by accident. Hence it is reasoned that there is no greater virtue in an exam-

plenty of coal and occasionally looks after the water. The manufacturer is thankful for the first condition of things, but has no redress for the second, which he bears, though with much complaining. Being thus situated he is compelled to depend upon himself and to so build his boiler of the best material obtainable that it will stand a certain amount of abuse. In the following we propose to briefly describe the methods pursued by the Babcock & Wilcox Company in testing the material entering into their boilers.

The testing may be said to begin at the tube makers', where the chip cut to form the scarf for welding gives a good indication of the quality of the metal. We show one of these chips in Fig. 6. As the tubes are received at the works they are weighed, and if they fall below the requirements per foot the whole consignment is returned. Overweight tubes are accepted, but light ones never. The tubes are also carefully inspected, to see if there are any lumps on the inside or outside. This inspection is repeated at each step as the work is put together.

Then from the tube is cut a ring, shown in Figs. 2 and 3, ¼ inch long. The ring

is then laid on the anvil of a drop hammer, and a drop weighing 1500 pounds is dropped 5 feet on each sample three times. The ring then has the appearance shown in Fig. 1. An inspection of the flattened ring clearly indicates the quality of the metal. It also shows whether there are any imperfections due to the method of making the tube sheet and the tube itself. One of the most important features brought out by this test is the degree of malleability of the metal. The proper metal will flow without crack and the outer edge of the ring will show no imperfections. A poorer metal will be cracked all around. This test is of the utmost importance, since it shows whether

strength. The thickness of the tube has been determined fully as much on the basis of what thickness of tube is necessary to stand a certain amount of wear and tear as anything else. The tube makers follow these requirements.

We show in Fig. 9 one of the hand hole clamps, which in the finished boiler occupies the position as shown in Fig. 8. These are placed in a ring, a bolt inserted, and they are then tested until broken. These stand a pull of from 55,000 to 65,000 pounds, and when they fail to come up to the requirements the quality of the metal is bettered.

The bolt, Fig. 10, holding down the hand-hole plate is, it may be said, sub-

safety has nothing to do. It will be noted in Fig. 8 that, even if this bolt should give way the hole would still be closed by the clamp. The plate steel must have a tensile strength of from 54,000 to 60,000 pounds, and an elongation of 25 per cent. in 8 inches. The phosphorus must not exceed .08 of 1 per cent. It must bear double test before and after being heated and plunged in water. From the foregoing some idea may be formed of the great care exercised in the selection of material. It is in every case the best obtainable and it must rigidly conform to all the requirements.

During the last few months a series of exhaustive and important trials with all

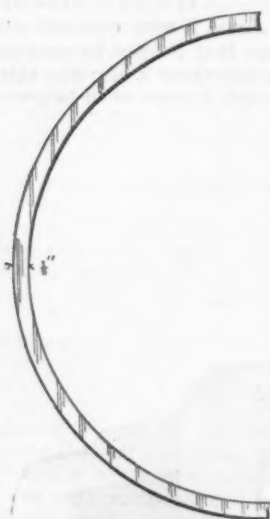


Fig. 2.—Edge View of Ring Before Hammering.



Fig. 1.—Ring After Having Been Struck by Hammer



Fig. 3.—Side View of Ring Before and After Hammering.



Fig. 4.—Good Quality of Metal.

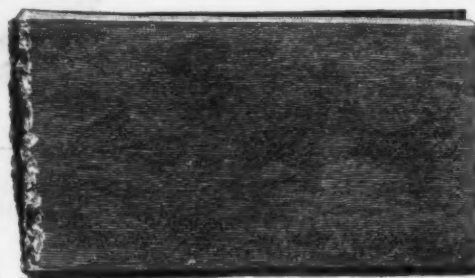


Fig. 5.—Poor Quality of Metal.

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the tube will flow sufficiently to fill the hole when expanded. These tube holes are made  $\frac{1}{8}$  inch larger than the tube as a maximum and a little over  $\frac{1}{8}$  inch as a minimum. The tubes are made smaller than the holes in order to permit their easy removal, even should their size be somewhat increased by deposits. In expanding a tube the punishment that the metal gets is not only due to this, but the tube seat is made flaring, as shown in Fig. 7. The metal, it will be observed, flows so as to make a shoulder. The same drawing shows the method of expanding a tube.

The engravings Figs. 4 and 5 represent specimens which have been bent over and hammered. One presents a clear surface at the bend, showing no flaw, while the other is ragged and broken. Tensile tests are not necessary, as there is ample

jected to two strains, both tensile, and of course in the same direction. If when this bolt is screwed down the power of the wrench is increased by a pipe slipped over it, and a certain unknown strain brought to bear upon the work due to the exertion of the strength of the man screwing up the bolt. When steam is brought on the hand-hole plate the strain on the bolt is augmented by just that much. Now, these bolts, being removed from time to time for cleaning, are screwed up again and again, each time being subjected to a strain greater than the one preceding. This results in the crystallization of the metal of the bolt, and away it goes. It is therefore evident that in this particular part of the boiler it is absolutely essential to put in a bolt that will surely stand the punishment it may receive, and in the calculating of which the ordinary factor of

classes of anchors have been carried out in Portsmouth Harbor, England. These trials culminated in a final test of merit in holding power on September 14, 15 and 16, when the British war ship Hero was ordered cut to Spithead to test the selected five anchors, chosen out of many previously tried in various ways. Hall's patent was decided to have the greatest holding power.

Engineering gives the results of a trial at Shoeburyness of an armor plate manufactured by John Brown & Co., Sheffield, which was hardened by the process of Captain Tresidder. It is claimed that the resisting quality of the face of compound armor is so increased that the best forged steel projectiles will fly to pieces. The records of the trial so far as published do not seem to bear out this claim.

### Tinning Cast Iron.

The following directions for tinning ordinary iron castings are communicated to *The Metal Worker* by a practical manufacturer of long experience and high reputation:

How to tin ordinary cast iron is a problem which is not easily solved; in fact, it is generally believed that there is no reliable process known, and before attempting any direct instructions it seems proper

much more difficult, and herein consists one of the main obstacles to be overcome. Certain articles of cast-iron hollow ware, used for culinary purposes, are tinned on the inside, the scale or surface being cut away on a lathe with a turning tool. The article is then heated and the tin melted on this prepared surface and satisfactory results obtained. But miscellaneous castings of irregular shapes cannot be treated in the same manner, hence the difficulty in the necessary preparation of the surface

sive results. We proceeded to tin these castings and had complete success and were quite elated over the result. We then ordered a larger quantity of the same kind of castings from the same foundry, and when we had utterly failed to tin them we concluded that the first lot were extraordinary castings and the last lot were nothing but ordinary cast iron. Since then we have investigated a number of so-called "sure processes" for tinning cast iron and have tried many other experiments and have found but one process that gives any satisfactory results.

It is a process which requires a complete retinning outfit. A regular tinning kettle is also required, as the article must first be tinned and afterward go through a retinning process. First in order is the cleaning or scaling. This is done in a pickle composed of, say, one-third muriatic acid and two-thirds water. The action of this pickle may be quickened with a jet of steam. Examine the work from time to time, using a wire brush to clean away the sand or other adherent matter. Black spots or blotches will also appear; these must be removed with brush or scraper. When finally clean, wash free from pickle and submerge the castings in clean water, where they may remain until you are ready to proceed with the tinning. As a flux for the tinning pot, also as a "dip" for the work before it goes into the tinning pot, make a saturated solution of sal-ammoniac, adding thereto an equal portion of muriatic acid. Never use zinc in any form about a tinning kettle. The tin being melted, dip the castings first in the "dip," then in the melted tin, moving them back and forth for a moment, then take them out of the tin, and unless the castings should be of the extraordinary kind you will not have a finished job, and the next operation will be to place them in the grease kettle, where they will remain 5 to 15 minutes. Then dip them into the retinning kettle and back again into the grease kettle, where you will hold them for a moment only, and draw out slowly. It may be necessary to repeat this operation in the retinning kettle. To free the finished work from grease use middlings. You must keep in mind the fact that no good result can be expected unless the work is thoroughly cleaned and free from scale before it enters the tinning pot.

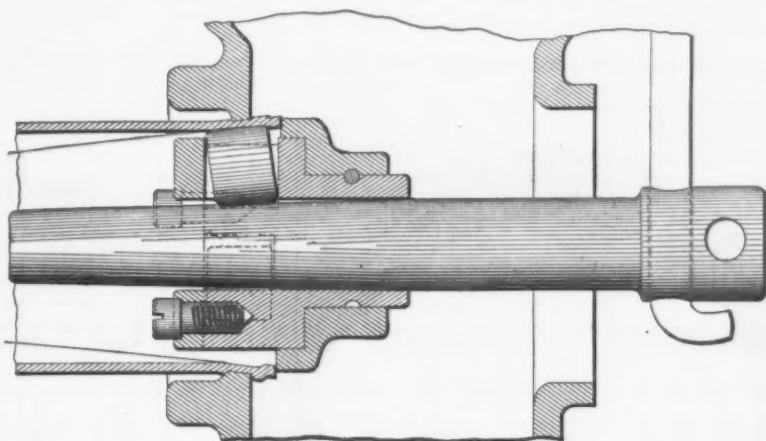


Fig. 7.—Expanding a Tube.

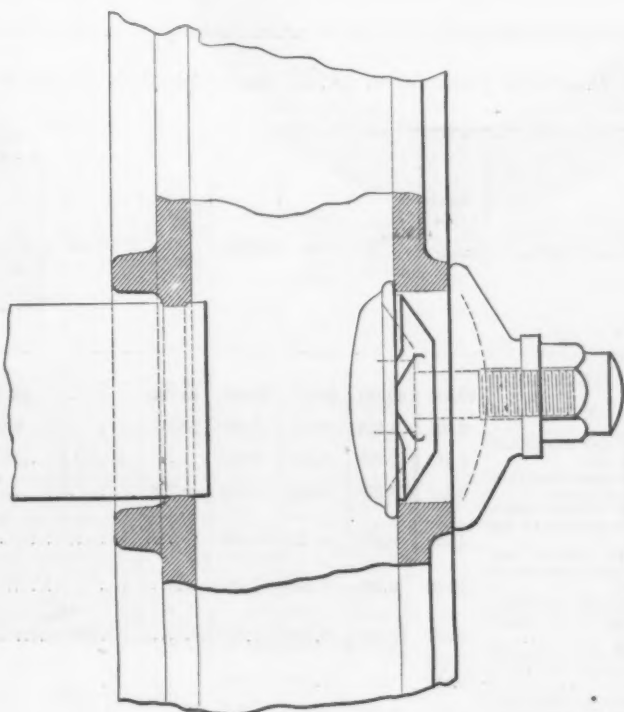


Fig. 8.—Showing Arrangement of Tube and Hand Hole.

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that we should state some general facts which pertain to the subject.

So-called malleable iron is composed of a mixture of certain qualities of pig iron melted together in certain proportions and cast the same as ordinary cast iron. It is then annealed, and if properly treated before entering the annealing oven it may be tinned as easily as wrought iron. All makers of malleable iron are supposed to know just what this proper treatment consists of. But when it is desired to tin ordinary castings it is found to be a very different matter. It is well known that no kind of metal can be tinned without first removing the scale or outer surface. This is easily done with wrought iron and other soft metals, but with cast iron it is

for tinning. Now, while it is so difficult to tin ordinary cast iron, extraordinary cast iron may be tinned without much difficulty. Certain qualities of pig iron melted together under certain conditions as to proportions, &c., is what we mean by extraordinary cast iron.

Any qualified foundryman, we think, could soon arrive at a correct formula and be able to make castings which could be easily tinned. As to it being a profitable venture for the foundryman, it would depend, of course, on the demand for that kind of castings. Some years ago we had a lot of small castings which it was desirable to have tinned. We had been through a number of experiments and had arrived at what we thought very conclu-

It now seems highly probable that the suits brought at Chicago for violations of the Interstate Commerce law will prove a fizzle. Such at least is the opinion entertained by those who have been carefully observing the proceedings in the United States Court in that city the past week. The marshals may summon, the district attorney may do his best to make a strong case and the Grand Jury may probe with their utmost diligence, but it will prove in these cases, as it always has proved in similar investigations, that men will not knowingly criminate themselves, if indeed they have been guilty of wrong doing.

Senator Maliano of Nicaragua, while visiting this city gave a very favorable account of the progress of the work on the canal, and predicts its success. Hitherto they have given their principal attention to the building of the railroad from San Juan to Ochoa, an undertaking that was at once costly and difficult, the intervening land being very swampy, and therefore having to be filled in a great part of the way. Another important piece of work that they have carried far on to completion is the building of the breakwater in Greytown Harbor. Before the work of digging the canal is undertaken the railroad will be built. The bed is on the point of being prepared for the laying of the ties that are already piled up more than half way.

## Wright's Report.—II.

### Cost of Production of Iron, Steel and Materials.

We presented in the last issue of *The Iron Age* the principal figures in the compilation of Carroll D. Wright, so far as they related to pig iron, puddled bar and rolled iron. We may deal now with his

tered in the first column above are, of course, apportioned in the second column among the whole seven establishments.]

The average price at which the pig iron is put in in the above summary is \$16.78. Mr. Wright has made no effort to get at the "direct labor cost" in the case of steel ingots.

#### Steel Rails.

We have already reviewed Mr. Wright's statements concerning the cost of steel rails. We need only add that since then

we have had the benefit of the opinion of the director of one of the largest rail mills in England, who emphatically declares that steel rails cannot be produced in Great Britain at \$18, which is the figure at which Mr. Wright is satisfied that they can be made "under normal conditions."

In spite of the meager data at his disposal, so far as the cost of conversion and rolling of steel rails is concerned, Mr. Wright has attempted to figure out the direct cost of labor. We quote as follows:

Table I.—Cost of Bessemer Steel Ingots.

Number.	Days of running time.	Used mainly for	Total gross tons.	Per day.	Pounds of materials to 1 ton of product				Cost of materials per ton of 2,240 pounds.				Total cost of materials.	Value of cinder, scrap, &c.	Net cost of materials.	Labor.	Officials and clerks.	Fuel.	Supplies and repairs.	Taxes.	Total.
					Pig iron.	Scrap.	Ferromanganese.	Other.	Pig iron.	Scrap.	Ferromanganese.	Other.									
1	126	Wire	54,479	432	2,299	221	18	0.48	\$16.735	\$15.728	\$57.021	\$127.118	\$19.755	\$0.009	\$19.746	\$1.838	\$0.275	\$0.794	\$0.831	\$0.092	\$23.571
2	117	Nails...	28,343	242	2,385	51	20	....	16.282	16.423	51.875	....	18.179	0.038	18.091	1.923	0.116	0.383	1.050	0.012	21.575
3	244	Ship and boiler plates, bars and	116,880	479	2,203	422	73	....	16.062	15.657	39.079	....	20.022	0.510	19.512	1.522	0.108	0.919	0.453	0.010	22.524
4	167	Nails....	24,617	147	2,326	114	24	....	17.000	17.000	66.148	....	19.137	0.032	19.105	1.692	0.116	0.490	1.595	0.015	22.893
5	363	Nails....	61,895	235	2,230	37	12	....	17.316	17.442	51.462	....	18.041	0.132	17.909	1.800	0.080	0.609	0.672	0.004	21.074
6	199	Nails....	68,790	346	2,269	....	25	....	17.000	....	56.400	....	18.788	0.018	18.770	1.716	0.051	0.385	0.616	0.006	21.694
7	209	Nails....	74,130	276	2,261	24	20	....	17.539	16.188	56.299	....	18.370	0.050	18.290	1.573	0.075	0.474	0.524	0.003	20.930

(a) Spiegeleisen.

data on the cost of steel in different forms. The first series of tables relates to

#### The Cost of Steel Ingots,

the greater part of the figures having been embodied in his preliminary report. (Table I.)

The heavy percentage of scrap used by establishment No. 3 will appear particularly striking. In the case of Nos. 4 and 7 pig iron was evidently produced at the works and charged to the Bessemer mill at a nominal figure. Mr. Wright summarizes his data as follows:

#### Summary of Cost of Steel Ingots (Bessemer Process) in Seven Establishments in the United States.

[This summary is drawn from sub-tables A to H immediately preceding. The establishments covered are Nos. 1 to 4, inclusive, and 6 to 8, inclusive, being all the Bessemer steel ingot mills in the United States from which reports have been obtained. As may be seen, the periods covered are irregular and are in the years 1888, 1889 and 1890.]

Elements of cost.	Tons of 2,240 pounds.	
	Cost of 429,134.	Average cost of one
Materials (net).....	\$8,094,679	\$18.863
Labor.....	720,021	1.678
Officials and clerks.....	47,766	0.111
Fuel.....	282,432	0.658
Supplies and repairs.....	287,778	0.671
Taxes.....	7,848	0.018
Total.....	\$9,440,724	\$21.900
Theoretical elements,*		
Insurance.....	\$1,300	\$0.003
Interest.....	22,187	0.052
Depreciation of value of plant.....	12,500	0.029
Total theoretical elements.....	\$35,987	\$0.084

\* SUMMARY OF COST OF THEORETICAL ELEMENTS IN THE ABOVE.

[Two establishments gave the amount paid for insurance; the aggregate of these makes the sum credited to this item above. Five reported that they had no insurance. Two establishments gave the amount paid for interest; the aggregate of these makes the sum above. Five reported that there was no expenditure for interest. One establishment gave the amount charged to depreciation, which makes the sum above. Six reported that nothing was charged to this depreciation. The sums en-

Table II.—Cost of Direct Labor, &c., in 1 Ton of Steel Rails, United States.

Materials and successive stages of conversion.	Direct labor.	Officials and clerks.	Supplies and repairs.	Taxes.	Transport to point where used.	Timber.	Difference between foregoing actual costs and costs as charged by blast furnace.	Total.
Production of 4137 pounds of iron ore.....	\$2.142	\$0.124	\$0.807	\$0.061	\$4.893	.....	\$2.926	\$10.973
Production of 1497 pounds of limestone.....	0.205	0.018	0.025	0.001	\$0.318	.....	0.038	0.603
Production of 4808 pounds of bituminous coal.....	1.973	0.068	0.140	0.013	.....	\$0.042	.....	2.245
Conversion of above coal into 3532 pounds of coke.....	0.598	0.076	0.072	0.009	0.738	.....	.....	1.493
Conversion of above materials into 2049 pounds of pig iron.....	1.576	0.134	0.718	0.054	.....	.....	.....	2.482
Conversion of above materials into 2,488 pounds of steel ingots.....	1.689	0.120	0.503	0.011	.....	.....	.....	2.323
Fuel (2230 pounds bituminous coal) used in ingot mill.....	0.912	0.092	0.069	0.006	.....	0.019	.....	1.038
Conversion of above ingots into 2240 pounds of steel rails.....	1.540	(a)	1.000	0.050	.....	.....	.....	2.590
Fuel (2340 pounds bituminous coal) used in rail mill.....	0.962	0.033	0.073	0.007	.....	0.020	.....	1.095
Total.....	\$11.597	\$0.805	\$3.416	\$0.232	\$5.940	\$0.081	\$2.902	\$24.843
Cost of 233 pounds of cinder, only the total of which can be given.....								0.94
Cost of 79 pounds of scrap and ferromanganese, only the total of which can be given.....								0.967
Total gross cost of 1 ton (2240 pounds) of steel rails.....								\$25.873
Deduct value of scrap produced in the ingot and rail mills.....								1.207
Total net cost of 1 ton (2240 pounds) of steel rails.....								\$24.666

#### SUMMARY OF THE ABOVE.

Total cost of ore, limestone, coal and coke.....	\$15.314
Cost of direct labor in producing the above materials.....	\$4.918
Per cent. of cost of direct labor in producing the above materials.....	32
Total cost of converting above materials and cinder into pig iron.....	\$2.482
Cost of direct labor in converting above materials and cinder into pig iron.....	\$1.576
Per cent. of cost of direct labor in converting above materials and cinder into pig iron.....	63
Total cost of converting pig iron and scrap and ferromanganese into steel ingots.....	\$3.261
Cost of direct labor in converting pig iron and scrap and ferromanganese into steel ingots.....	\$2.601
Per cent. of cost of direct labor in converting pig iron and scrap and ferromanganese into steel ingots.....	77
Total cost of converting steel ingots into 2240 pounds steel rails.....	\$3.085
Cost of direct labor in converting steel ingots into 2240 pounds of steel rails.....	\$2.502
Per cent. of cost of direct labor in converting steel ingots into 2240 pounds of steel rails.....	68
Total net cost of 1 ton of steel rails.....	\$24.666
Cost of direct labor in 1 ton of steel rails.....	\$11.597
Per cent. of cost of direct labor in 1 ton of steel rails.....	47

a Not reported.

In treating the cost of production of pig iron in the earlier pages of this report, considerable space was given to the results of an attempt to follow the materials from which iron is made back to the earth from which they are mined, and to determine how much was paid at each step, from the mining to the conversion of the materials in the blast furnace, for direct labor, how much for the salaries of officials and clerks engaged in the administrative work, how much for supplies, repairs and taxes and how much for transportation of the materials to the point where used. The reader will do well to examine what was there presented on this subject for pig iron. The attempt has been made to carry out a similar analysis for steel rails, and the tables exhibiting the results will immediately follow, but the difficulties in the way make the work far less satisfactory than for pig iron. These difficulties lie in the additional process of ingots, blooms and rails through which the materials must be traced, and in the fact that it was possible to get any information from only a few rail mills. There is first presented the results obtained by analyzing establishment No. 1 of Table VI, situated in the United States. The conditions were such in this case that it was impossible to trace out the actual materials used, and the table is made up from averages. Thus six representative establishments producing ore fit for Bessemer pig were taken, and an average for direct labor and each of the other items figured out. Coal,

With rods at \$35, delivered at mill, the cost, other data remaining the same, would be \$55.84, or 2.49 cents per pound, so that evidently a large proportion of fine market wire must be included in the product. The rod mill started with \$28.33 billets. They might probably be put into the mill now at \$25.50, which, other items of costs being unchanged, would put the cost of the rods at \$35.07. We note these figures because they indicate that sellers are truthful when they state that present prices are at or below cost of production.

(To be continued.)

### Square-Hole Drilling Machine.

Some time since the English technical journals described an ingenious machine for the production of geometrical or irregularly shaped holes. Now the papers describe the machine as at present made. The general appearance of the tool is that of a hollow-framed drilling machine, but the essential features of the invention are contained in the drilling head. The

spindle must describe a similar figure, therefore the point of the tool which is situated on the center line of the spindle describes the required figure. The cutting tool is made of a square piece of steel sharpened away to a single cutting edge, the point being on the center line, and it, therefore, describes the outside of the figure.

The entire saddle carrying the spindle and driving gear is now fed down into the work, and the drill point continuing to describe the same sized figure, it follows that a parallel hole is formed of the shape required, and the result, with the tool illustrated, is remarkably clear and well defined, the corners being sharp and clean, and the speed of drilling being about equal to that of good ordinary machine drilling. It is possible, however, to drill a hole either tapered outward or inward by varying the position of the taper guide wheel as regards the die ring. This remarkable result is accomplished by a hand wheel connected by a screw and a link to the guide wheel, whereby it may be raised or lowered within the die ring, its larger or smaller

Table III.—Cost of Miscellaneous Steel.

Days running.		Description,	Product.		Pounds of materials to 1 ton of product.			Cost of materials per gross ton.			Elements of Cost in 1 Ton.								
			Total. Gross tons.	Per day. Gross tons.	Ingots.	Billets.	Other.	In-gots.	Billets.	Other.	Total.	Value of chiller, scrap, &c.	Net.	Labor.	Officials and clerks.	Fuel.	Supplies and repairs.	Taxes.	Total.
12	110	Billets.....	37,160	338	2,516	.....	.....	\$22,974	.....	.....	\$26,831	\$1.946	\$24,884	\$1,623	\$0.302	\$0.400	\$0.204	\$0.089	\$27,682
16	167	Billets and slabs...	21,916	216	2,516	.....	.....	22,893	.....	.....	25,714	0.089	25,625	1,270	0.130	0.233	0.416	0.023	27,703
17	117	Billets and nail slabs....	25,262	216	2,513	.....	.....	21,575	.....	.....	24,206	0.342	23,864	1,182	0.130	0.311	0.991	0.026	26,504
26	269	Blooms and billets.	64,684	240	2,567	.....	.....	30,938	.....	.....	23,996	0.331	23,665	1,252	0.096	0.272	0.276	0.008	25,559
27	263	Blooms and billets.	52,962	201	2,618	.....	.....	21,073	.....	.....	24,628	0.077	24,551	1,108	0.094	0.209	0.366	0.010	26,398
28	190	Blooms, billets and nail slabs .....	61,240	308	2,516	.....	.....	21,741	.....	.....	24,422	0.042	24,380	1,306	0.057	0.311	0.343	0.104	26,501
29	281	Blooms, billets and slabs.....	55,036	190	2,491	.....	.....	23,250	.....	.....	25,854	0.607	25,247	1,089	0.218	0.650	0.704	0.027	27,635
41	290	Plates (boiler and tank).....	6,004	21	2,889	.....	.....	31,000	.....	.....	39,984	4.411	35,573	8,072	0.570	1,458	1,458	0.096	47,225
60	290	Wire.....	36,797	127	.....	.....	.....	\$2,998	.....	.....	44,242	.....	44,242	14,491	0.652	2,184	2,629	0.027	64,295
61	299	Wire rods.....	26,485	89	.....	.....	.....	\$2,500	.....	.....	31,732	0.600	31,132	3,541	0.453	2,250	0.410	0.057	37,643

a Steel rods.

coke, and limestone were treated in the same way. The average cost for conversion of raw materials into pig was similarly obtained from a half dozen blast furnaces. Thus, step by step, the work was followed up to the necessary quantity of ingots, and finally to the finished ton of steel rails. The entire costs when summed up were found to be \$24.666, while the cost as tabulated in sub-table E is \$24.799, a difference of only 13.3 cents. The table is now given. (See Table II.)

Mr. Wright's chosen mill is evidently in the Pittsburgh district, since he makes the cost of transportation on the coke only 73.8 cents, and puts in the fuel at actual cost, so that the product bears only the profits of the ore miner and the limestone quarry. Mr. Wright's mill has reached the perfection of getting along without seconds and yet is unable to reach his ideal of \$22 rails.

It may be of interest to note that establishment No. 16 in Table III is No. 4 of the table relating to steel making, that No. 17 is No. 2 of the same table and that apparently No. 26 and No. 8 and No. 27 and No. 7 are identical. The cost sheet of No. 4 and 16 was based on \$17 pig and scrap. Putting the cost of pig down to \$15.50 this mill could make billets at \$26 now and would therefore do a losing business, while No. 2 and 17 could get down to about \$25.50 and No. 8 and 26 would reach about \$23.50. In this case, however, an unknown percentage of blooms is rolled. It will be noted that the wire mill reporting starts with a high cost of rods.

spindle is fitted about the middle of its length with a ball joint carried in an adjustable bearing, and by this means it can be not only revolved upon its axis, but at the same time may be vibrated as required by the shape to be drilled.

The means of driving and, at the same time, of vibrating the spindle, are ingenious and simple. The upper portion of the spindle is guided horizontally by a small slide, which slides across the face of a horizontal spur wheel, by which it is caused to revolve. This slide is so constructed that when it is at one end of its travel the spindle is vertical, and in this position would revolve upon its axis. In this position it is clamped when being used for ordinary drilling. From this position the slide is constantly urged by two springs which, acting like a centrifugal force, cause the centre of the spindle to describe a figure, the shape of which is determined by the template or die in use. The spindle is extended above the driving spur wheel to receive the guide wheel. The guide wheel, which is of cast steel, rolls round inside the die plate, which is simply an annular cam. The die plate is held stationary in a horizontal position while the wheel rolls round inside it, being kept in contact with it by the springs, and thus the center of the roller is compelled to describe the desired shape. By reason of the ball joint, whatever shape the center of the roller describes every other point in the center line of the

diameter causing a less or greater vibration of the spindle point, and this being done while the tool is at work, the operator is enabled gradually to increase or decrease the size of the figure under construction during the sinking of the hole. It will be readily seen how valuable such a result may be made in the securing of studs and lewis bolts and the insertion of plugs in unsound castings.

The driving wheel is provided with a sleeve, and rotates in a large bearing, and is, of course, bored out large enough to clear the vibrating spindle. The wheel is connected to a pinion on a quill, rotating in a bearing fixed on the head, and with a sliding feather engaging a vertical shaft operated by the driving gear. Self-acting feed is attached in the ordinary manner to sliding head. The tool is substantially designed and well made, and by means of a few die rings it will cut a variety of forms of hole. The Square Drilling Machine Company, of which Reginald Bolton is the managing director, have adopted two standard patterns, and are proceeding with the adaptation of the system to various forms of drilling and milling machines.

The machine is made by the Square Drilling Machine Company of 100C Queen Victoria street, London. We may add to the above that we have seen specimens of work done by this machine—squares, octagons and stars—in which the sides are sharp and straight and the corners clean and well cut.

### Link Bending Machine.

During the visit of the Mechanical Engineers to Richmond they were shown, at the Tredegar Iron Works, a machine for bending up flattened links, such as are used for coupling cars. This machine is the invention of John W. R. Johnson, and has been assigned to the Tredegar Company. It cuts the link blank from a hot rod which has been inserted in it. The ends of the rod are then scarfed for welding, and the blank brought to the proper shape by being pressed around a form or mandrel by rollers, so that its ends overlap. We are informed that it was expected to cut the blank, scarf the ends, bend to the required form, and finally do the welding all at the same heat. The machine is mounted on a fixed frame, A, on opposite sides of which are side plates B B', which are made movable toward and from the center line of the machine or the line of traverse of the mandrel, and are adapted to be held in their adjusted position by set screws. The machine is thus rendered capable of making links of different lengths. On these side plates are mounted stands C C', Figs. 1 and 3. A shear bar, D, Figs. 1 and 2, moves vertically in guides in the stand C, and carries on its lower end a rod guide through which the blank is inserted endwise. This provides for the shearing of the end of the rod at its entrance to the machine. A corresponding stop or gauge bar, E, moves vertically in guides in the opposite or left-hand stand C'. The bending pins F F' also move endwise in guides slightly inclined from the vertical in the stands. The lower ends of these pins when in their lowest position rest in sockets in the side bars B B', to enable them to resist the lateral strain to which they are subjected when bending a blank. They are inclined in opposite directions and serve to bend the opposite ends of the blanks above and below their planes to enable them to overlap when joined. These pins are also reciprocated endwise in and out of the plane of the blanks by means of bell cranks suitably connected. The grippers G G' rock vertically parallel with the inner faces of the stands to hold the blank down firmly while its ends are being bent. The center bending rolls I I', Figs. 4, 5 and 6, turn loosely on blocks adjustable laterally in the bed plate and capable of being held in any desired position by clamp screws to suit different widths of links. Slide frames K K' move freely endwise in the guides in the slide plates and are also adjustable. The outer bending rolls J J' turn on vertical pivots near the outer ends of the lower bars of these slide frames. The knife L, Figs. 1 and 2, co-operates with the shear in severing and scarfing the blank. The slide frames K K' slide laterally at their downward ends upon the crosshead M, Fig. 2, thus accommodating the lateral adjustment to the slide frames and slide plates. This crosshead is reciprocated by a pitman properly connected. A center head, N, mounted on this crosshead carries a socket in which the front end of a center bar fits. The rear ends of this bar slide through a bearing in an upright mounted on an extension, A', of the bed plate. An adjustable connecting bar, P, projects from the center head downward a short distance from the center bar. Parallel elbow levers P P' rock vertically on the center pivot on this overhanging arm. The downward arm of these levers is connected by a pivot to the center bar O, Fig. 1, while their rear arms are pin jointed to a mandrel block, R, carrying a mandrel, R', Fig. 6, on its lower side.

The operation of the machine is thus described in the letters patent issued to Mr. Johnson, from which we obtained our information:

The work is done by a series of reciprocations or backward and forward strokes of the moving parts of the apparatus. While the knife L is retracted, a heated rod or blank is inserted endwise through the rod guide a short distance. On the next forward stroke the knife severs and scarfs this end of the rod. The crop end of the bar is swept out on the next back stroke. The hot rod is then pushed endwise across the machine until its inner end rests in the stop gauge E', Fig. 4. The knife then advances and cuts off the other

in their lowest position in line with the rod, and the grippers G G' rest upon the rod near each end. The rod guide, the stop gauge, the bending pins, the guide apron, and the center bending rolls, being mounted on the slide plates, all remain stationary. The center bar has a slight endwise play in its bearings, while the slide frames K K' move freely endwise, but always in the same horizontal plane with the crosshead and center head.

As a consequence of this organization on the next back stroke the grip plates ride

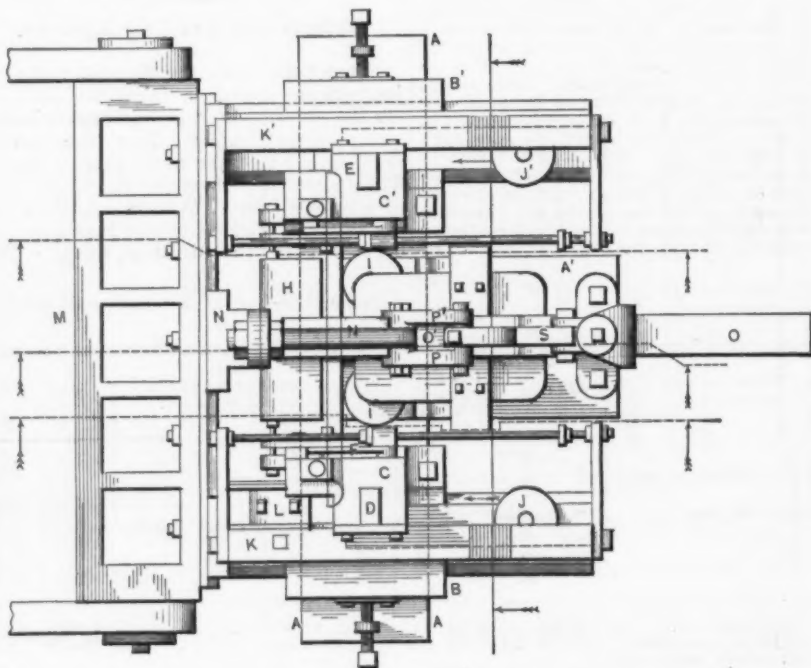


Fig. 1.—Plan, Showing Parts in Forward Position.

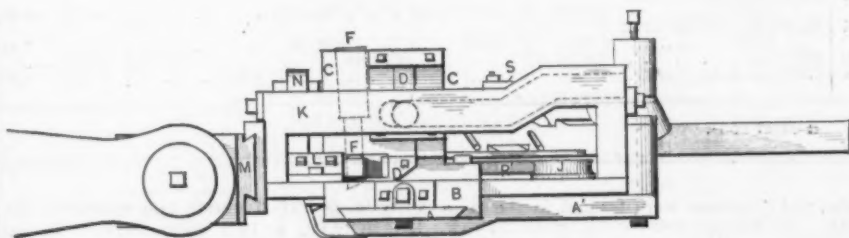


Fig. 2.—Side Elevation.

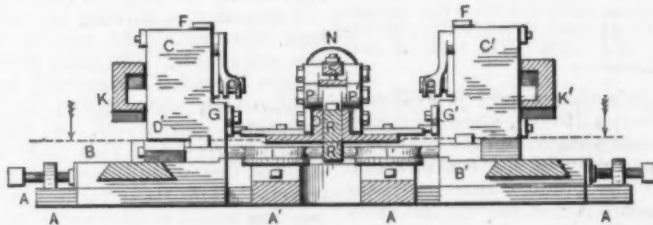


Fig. 3.—Vertical Transverse Section.

### LINK BENDING MACHINE.

end of the blank, this operation taking place at the end of the forward stroke, when the parts occupy the position shown in the first four figures of the drawings. These figures show the rod as lying between the bending pins F F' and guide apron H on one side, and the stands C C' and the center bending rolls I I' on the other side. The rod also rests near each end on the slide plates B B', with its ends projecting slightly beyond the stands, as shown plainly in Fig. 4. In this position the bending pins are inserted in their sockets, the rod guide and stop gauge are

over the cam lugs on the grippers to hold the rod securely in place. The bending rollers J J' then come into action, passing backward into the position shown in Fig. 5, under the shear bar and gauge bar, and bend the ends of the blank around the bending pins F F', they being firmly supported laterally against the strain to which they are subjected at this moment by their lower ends being inserted in sockets in the slide plates. The center bar O, having slight end play in its bearings, does not partake of the first backward movement of the slide frame; but the elbow levers P P',

pivoted thereto, do partake of this movement, being connected with the crosshead by the center head N. The center bar is, in fact, held positively against backward movement by its lug engaging with the catch of a weighted lever. The center bar being thus held while the backward movement of the center head continues, the mandrel R' is raised up through the ver-

Toward the termination of the back stroke the knockers strike the bell cranks of the bending pins and lift them also out of their sockets and out of the way, they being retained in this upward position by suitable friction springs. At the beginning of the next forward stroke the friction block holds the center bar temporarily while the center head advances. This

The completed link is stripped from the mandrel as it rises through the center bar on the back stroke and drops out of the machine. The blank, it will be observed, is formed mainly by the co-operation of the mandrel and four bending rollers with the bending pins, the ends of the link being bent on the back stroke of the machine and its formation completed on the suc-

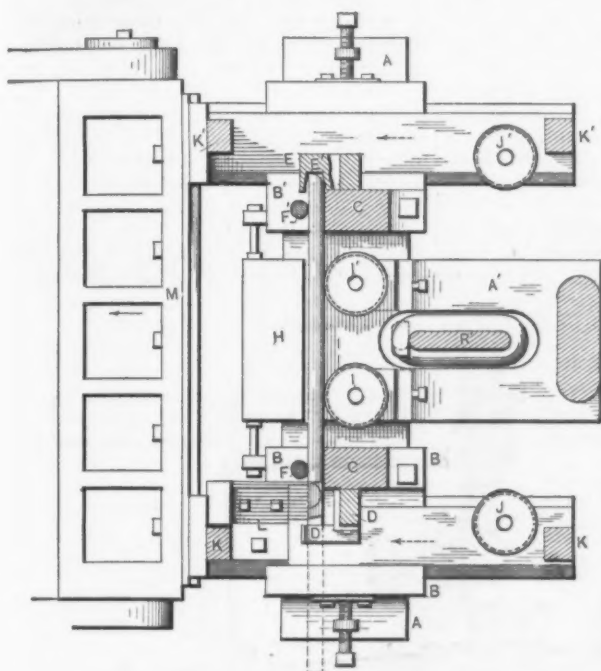


Fig. 4.—Sectional Plan.

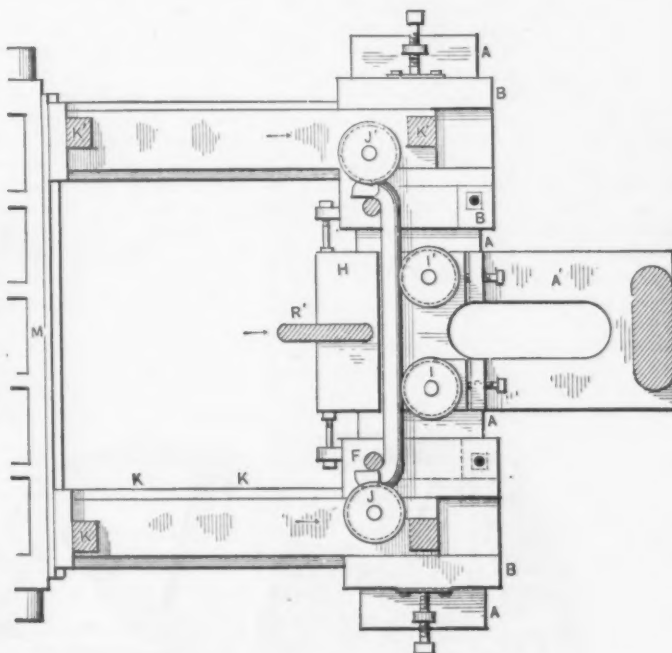


Fig. 5.—Section Similar to Fig. 4, but with the Parts Retruded.

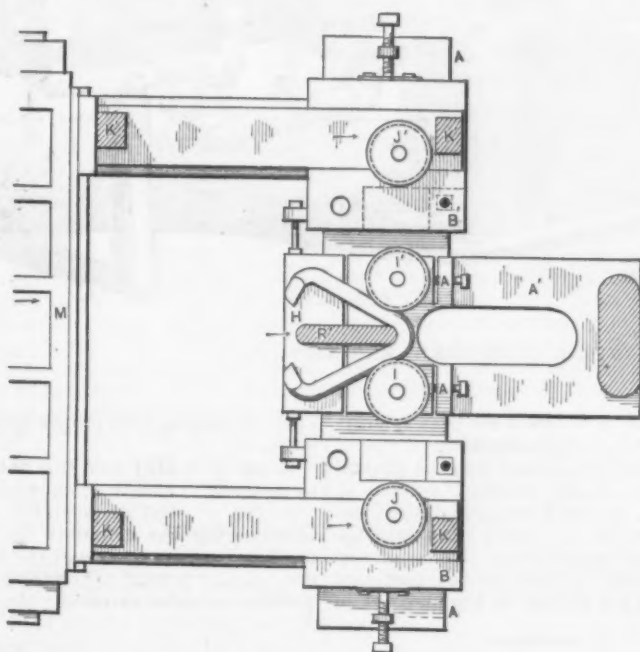


Fig. 6.—Similar to Fig 5, but Showing the Bending of Link.

#### LINK BENDING MACHINE.

tical slot in the center bar above the plane of the link blank and the bending rollers by the action of the elbow levers, which in their upward movement release the catch lever and allow the center bar and mandrel to move backward with the slide frame into the position shown in Fig. 5, where it lies in front of the blank and over the guide apron. Simultaneously with this backward movement of the mandrel the grippers are released from pressing on the blank and thrown up by their springs out of the way.

depresses the mandrel into the plane of the link blank, during which movement it rides over and depresses the guide apron out of the way. In its continued forward movement the mandrel passes between the center bending rolls and bends the link. Fig. 6 shows this bending as partly completed. It will be understood that a new blank is inserted as the formation of the preceding one is completed. The completion of this forward movement restores all the parts to their normal position shown in the first four drawings.

ceeding forward stroke, thus requiring less power than if the whole operation was performed during a single stroke of the machine.

#### Progress of the Locomotive.

An impressive ceremony took place at Bordentown, N. J., on the 12th inst. at the formal completion of a monument erected to mark the spot where sixty years ago the first piece of track was laid between New York and Philadelphia, inaugurating the present railway system of the United States. Before that date only a few desultory efforts had been made to introduce steam transportation by rail, and these mostly of an experimental character. The monument is a granite monolith 5 feet square resting on a circular pedestal of granite blocks, upon which were placed the original rails of the roadbed. Upon this pedestal rest a dozen other blocks of granite with a similar history, and upon these blocks is spiked with original spikes one of the first rails laid, which has been bent into a circle. On a bronze relief is pictured the historical locomotive John Bull and the queer-looking train of three cars that it first hauled over the Camden and Amboy road. These dedicatory ceremonies consisted of an address of presentation by Joseph T. Richards, assistant chief engineer of the Pennsylvania Railroad, an address of acceptance by F. Wolcott Jackson, general superintendent United Railroads of New Jersey Division, Pennsylvania Railroad Company, and an historical address, "The Camden and Amboy Railroad, Origin and Early History," by J. Elfreth Watkins, curator of the section of transportation and engineering, United States Museum, Smithsonian Institution, Washington, who was once the assistant engineer of the railroad company.

Mr. Watkins referred to the early days when Perth Amboy was a rival of New

York and to the competition for traffic that resulted in the granting of a charter to the Camden and Amboy Railroad, and to the Delaware and Raritan Canal Company. The railroad charter provided that its capital stock was to be \$1,000,000, with right to increase to \$1,500,000. Robert Stevens was elected the first president and the chief engineer of the road. The surveying was completed during the year 1830. Then Robert L. Stevens started for England. At that time no rolling mill in America would take a contract to roll T-rails. Such railroads as were in operation used either a wooden rail or a stone stringer plated with strap iron. His railroad authorized him to obtain such rails as he desired. On the voyage over he whiled away the hours whittling, and the result was substantially the invention of the base to the T-rail, instead of the expensive chair, the hook-headed railroad spike and other improvements. He had great difficulty in getting

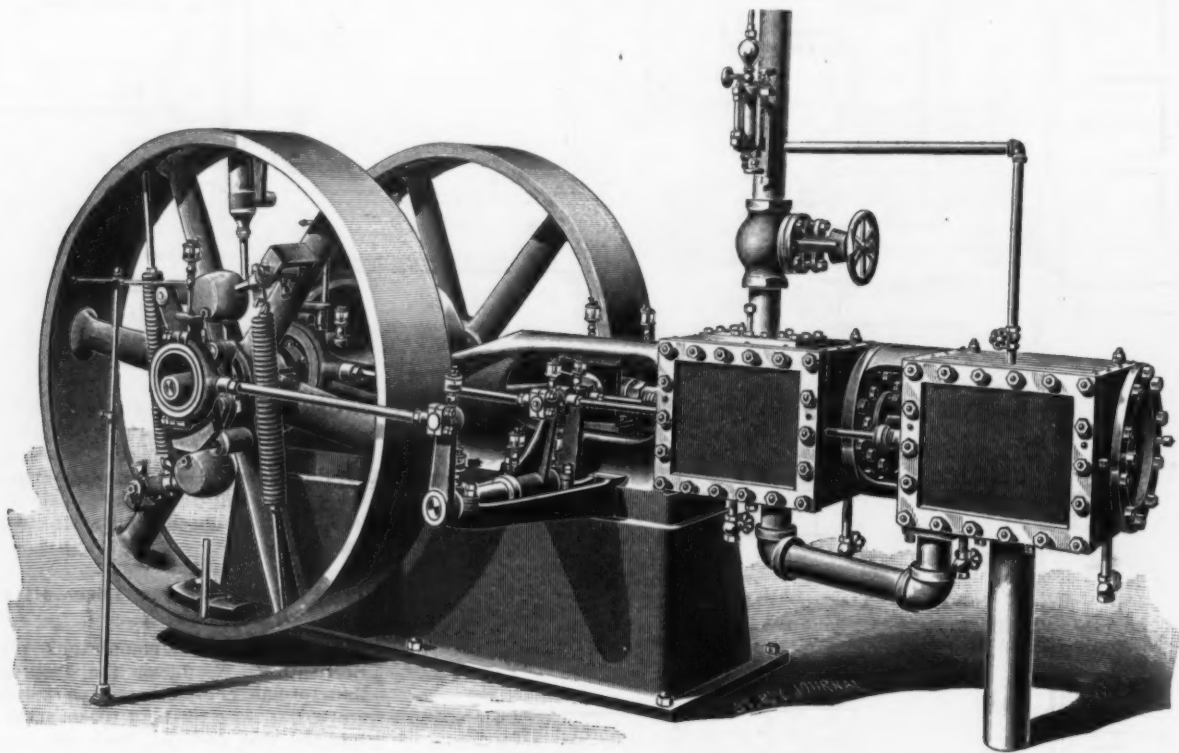
frightened about taking a ride, but finally were induced to get on board. Mme. Murat, wife of Prince Murat, a nephew of Napoleon Bonaparte, who was then living in Bordentown, insisted upon being and was the first woman to ride on the train. It made several successful trips during the day. In the evening there was a grand reception, and until the next morning the town simply went drunk with delight.

The "John Bull" was then put under cover until the railroad should be completed. The company opened shops at Hoboken, and there other locomotives and cars were built. Matthias Baldwin, acting under orders from the proprietor of Peale's Museum, in Philadelphia, to build a toy locomotive for his establishment, went to see the "John Bull." He constructed his toy and it created a sensation at once. On the strength of the improvements he had shown in it he was ordered to build the celebrated "Old Ironsides" for the Germantown Railroad Company. Since that

high pressure (125 to 150 pounds) so desirable in compounding.

The high-pressure valve is operated by the governor from an eccentric which is outside the pulley. Any part of the governor may be very easily gotten at. The low-pressure valve is driven by a fixed eccentric, the valve rod passing through the steam chest of high pressure cylinder.

The governor is of the general class on which the centrifugal force acting upon the weights causes them to move out or in, as the case may be, thereby shifting the eccentric across the shaft and lengthening or shortening the cut off. In detail, the governor is a distinct type by itself. The weights are attached to a rotating or primary eccentric, upon which is a collar, pinned to a secondary eccentric, which is moved back and forth across the shaft as the weights go out or in. The range of the governor is from the point where the valve cuts off at five-eighth stroke to the point where the valve opens just enough to



THE PAYNE TANDEM COMPOUND ENGINE.

the English iron masters to roll his rails, but Sir John Guest finally did so at his Welsh mill. The first consignment arrived in this country in May, 1831, and over 30 miles of rail was laid before the summer of 1832. The rails were laid upon stone blocks. The Stevens rail and the hook-headed spike invented by Mr. Stevens are used to-day on all American railroads. While Mr. Stevens was abroad he also examined the locomotives which were being constructed and ordered one, which was known to the world as the "John Bull." It arrived in this country in August, 1831. Its loose parts were all shipped separately. John Dripps was detailed to put the engine together. Dripps had never seen a locomotive, nor had he any drawings. Yet, after many attempts, he succeeded in getting it set up on the rails at Bordentown.

No tender came with the locomotive, so one was improvised. The water tank consisted of a large whisky cask on a flat car. Sixty years ago the State officials came to Bordentown in stages to witness a trial. Two coaches, each of which had four wheels and resembled three carriage bodies joined together, were attached to the train. The law makers were somewhat

day the name of Baldwin has been synonymous with the word locomotive.

Mr. Watkins then went into the general development of the railroad system of New Jersey, by the absorption of the Camden and Amboy and other lines into the great Pennsylvania system. He concluded with a splendid tribute to the part that the railroad has played in the progress of the world.

#### Tandem Compound Engine.

We here present an engraving of the tandem automatic compound engine built by B. W. Payne & Sons of Elmira, N. Y., and 45 Dey street, New York City. The high-pressure valve consists of a truncated wedge with the ordinary exhaust pocket of the common D valve, and has double ports. On the back or inclined surface rests an adjustable pressure plate so arranged as to entirely exclude the steam pressure from the back of the valve and permit it to adjust itself for wear. The valve is thus perfectly balanced, and the governor relieved from the duty of driving it. This is stated to be the only slide valve in successful use under the extreme

keep the engine at its proper speed without labor.

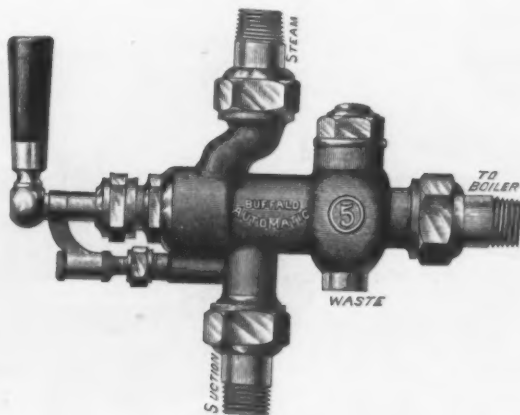
It can be readily seen that this governor by its peculiar construction is an extremely sensitive as well as powerful regulator. In arranging the cylinders the usual custom has been reversed and the high-pressure cylinder is next to the frame, the low-pressure cylinder extending beyond, where it is supported by a large foot. This furnishes ready access to either piston, as the outer high-pressure head and the inner low-pressure head will pass through the low-pressure cylinder, and both pistons can be removed without the least inconvenience, whereas, with the low-pressure cylinder next the frame, the high-pressure cylinder must be disconnected in order to get at both pistons.

Aside from this compound, the above firm build horizontal and vertical automatic engines.

Eastern cotton mills are doing business on the smallest margin of profit. Forty-one mills in Fall River paid less than 2 per cent. during the last three months, and others either paid nothing or lost money.

### The Buffalo Automatic Injector.

The Buffalo Automatic Injector, made by the Sherwood Mfg. Company of Buffalo, N. Y., and of which an engraving is here presented, belongs to that class commonly known as restarting injectors, in which the injection of water is automatically resumed when the flow of water has been interrupted from any cause. This invention has the object to produce valve mechanism by which the water valve and the steam valve are operated simultaneously, whereby the supply of water to the injector is at all times proportionate to the steam supply, both of the valves being operated by one handle. By turning this handle in the proper direction the steam valve recedes from its seat and admits steam into the nozzle. During the lengthwise movement of the steam valve and its stem, the water valve is opened owing to the yoke connecting the water valve rod with the steam valve stem, thereby actuating the water valve simultaneously with the steam valve at all times. The movement of the steam and water valves and their relative position are such that the supply of water will always be in proportion to the supply of steam admitted to the nozzle, thereby insuring the proper working of the in-



THE BUFFALO AUTOMATIC INJECTOR.

jector and preventing an excess supply of water, which is liable to take place when using a water valve operating independently of the steam valve. The simultaneous closing of the water valve with the steam valve is very desirable when water is supplied to the injector under pressure, in which case, with other machines, water is often forced through the injector after the steam valve has been closed, by neglecting to close the water valve.

By the operation of the steam and water valves simultaneously the capacity of this machine can be graded so that in feeding a boiler a quantity of water can be fed into the boiler equal to the amount that is being evaporated, thus enabling an engineer to run the injector continuously, producing a most economical result in boiler feeding.

On a recent test of this machine an injector with 1-inch connections with 65 pounds of steam pressure would feed at its smallest capacity 277 gallons per hour and could be graded up to 572 gallons per hour under the same steam pressure, something that has, it is claimed, never before been accomplished in an injector.

It will be noted that no valves are required in either steam or supply pipe, the machine being operated entirely by one handle, both in starting and stopping, as well as in grading the supply.

The Supreme Court of the United States has rendered a decision in the case of *Magowan et al. vs. the New York Belting*

and Packing Company. The patent of Dennis C. Gately for packing, assigned to the New York Belting and Packing Company, issued January 26, 1869, is sustained and held infringed.

### Shipbuilding at Chicago.

The keel for what is claimed will be the largest steamer on fresh water in the world will soon be laid in the shipyard of the Chicago Shipbuilding Company in South Chicago. She will be 330 feet keel, 350 feet over all, 45 feet beam, and 24½ feet deep, and will carry on the ordinary stage of water in the lake channels over 4000 tons. With an increase of depth of water on the great lakes, as now contemplated, the new boat will carry without trouble over 5000 tons. She will be built for the Minnesota Steamship Company, for which the two steel steamers constructed last winter at the Chicago shipyard were also constructed. A sister boat of exactly the same dimensions will be built at the same time at the Globe Iron Works in Cleveland. Both steamers will be given power to drive them 14 miles an hour. They have triple-expansion engines and will be fed by three boilers 12 x 12 feet. They will be ready

for service at the opening of navigation next year. The resumption of work at the South Chicago shipyards will be welcome news to many workmen at that place. These yards have been idle since last spring owing to the depression in the lake shipbuilding trade.

The "Journal" of the Franklin Institute publishes in its November number a report of the Committee on Science and the Arts on the Bevington process of welding metals and spinning and shaping tubes. This is the process in which Mr. Mortimer McRoberts of the Plume & Atwood Company, Chicago, is interested and of which *The Iron Age* printed a description under the title of "Welding Copper" in its issue of March 12, 1891. The committee in question concluded its report as follows: "The capacity of this invention for uses in the arts seems to your committee as almost unlimited, when circular forms of ductile metal are required. The series of helically coiled or twisted welded wires is one of the many interesting specimens produced by this invention. It has already been applied commercially, with satisfactory results, to cartridge cans for dynamite projectiles, and, so far as your committee can judge, develops fully the best strength of the material. The invention appears entirely novel, is simple and easily managed and economical, and does not require a very costly plant, and in the opinion of your sub-committee deserves recognition by the award of the Elliott Cresson

medal." The report is signed by Luther L. Cheney, John Hall, Francis Leclerc and S. Lloyd Wiegand.

### The Affairs of Brown, Bonnell & Co.

The Supreme Court of the United States has handed down an opinion in the case of the Lake Superior Iron Company against Brown, Bonnell & Co. and others, a proceeding in error on exceptions to the opinion of the Hon. Augustus J. Ricks, district judge of the Northern District of Ohio.

The Supreme Court, by the decision, confirms and approves the decision of Judge Ricks. The case is one of the most important in the history of the court. The original proceedings were commenced February 19, 1883, when the Republic Iron Company of Negaunee, Mich., began a suit in attachment against Brown, Bonnell & Co., and a receiver was appointed. At the October term of the Supreme Court in 1889 a decree was entered affirming the order of sale of Brown, Bonnell & Co.'s works, issued by the United States Court of the Northern District of Ohio at the February term, 1886. On May 26, 1890, a mandate was received directing the court to enforce its decree. In pursuance of this mandate an order of sale was issued on June 3, 1890, directing the Special Master Commissioner to appraise, advertise and sell the property. On July 23 following the Master Commissioner returned the order of sale, reporting that he had sold the property to William McCreery, Henry Tod, Charles C. Baldwin and Cecil D. Hine, as trustees, for \$700,000. Exceptions taken to the Master's report were filed by the Leadville Coal Company on August 22, 1890, on behalf of themselves and such other creditors of Brown, Bonnell & Co. as chose to join therein. A motion was also filed on behalf of the purchasers to confirm the sale. Judge Ricks confirmed the sale and overruled the objections. It was this decision that the Supreme Court affirmed. The court closed by congratulating the circuit judges and his own predecessor for the management of the plant. For ten years or more Fayette Brown has been receiver and has managed the property admirably, reporting each month to the clerk of the Circuit Court.

Now that the United States Supreme Court has finally ended the litigation, it is believed that the syndicate which purchased all the plants of Brown, Bonnell & Co. will take possession of the same and operate them. It is stated that a plan has already been proposed to reorganize the corporation of Brown, Bonnell & Co. It is the purpose of those interested for the creditors to take stock in the concern to the extent of their claim, and those who do not desire to do this will probably be paid on satisfactory terms. It is the impression that just as soon as Fayette Brown can conveniently file his final report in the courts the creditors will take possession of the plants and operate them.

The city authorities state that the use of electricity in turning the Rush street bridge in Chicago has proved a great failure so far as the public are concerned. In order to make sure that the bridge will be turned out of the way of vessels the bridge tender is compelled to swing from two to five minutes before the boat enters the draw, and after the vessel has passed through the bridge is almost as slow in closing. The public is deprived the use of the roadway twice as much as it ought to be with suitable steam power. The inefficiency of the electric apparatus is probably due to the weakness of the current, which is supplied from the city's power plant used for public lighting.

### The Hawley Smokeless Furnace.

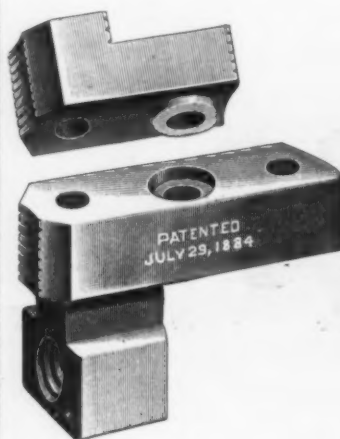
For several years past the smoke nuisance has been on the increase in Chicago, owing to the growth of its manufacturing interests and the erection of numerous high buildings requiring steam power for various purposes. While the city authorities have tried to abate the trouble, comparatively little has been accomplished. Smoke-preventing devices are in use on a great many furnaces, it is true, but the results are not commensurate with the efforts made to overcome the difficulty. It would seem that in very many cases the smoke-preventing devices have been of a complicated character, requiring an exceedingly competent fireman to make them work properly.

Some two years since Col. T. W. Yardley of the Robert W. Hunt Inspection Bureau, 633 Rookery, Chicago, had occasion to familiarize himself with the various methods now in use for the prevention of smoke. He found that the problem confronting users of steam power was not so much the securing of an effective device, as that could be found if one was willing to bear the expense of reconstructing his steam plant or hiring a high salaried fireman, but it was the obtaining of an inexpensive furnace that would not produce smoke under any conditions of firing. These requirements he has found in the Hawley down-draft furnace, which he is now introducing in Chicago. A plant has just been erected on this system by N. K. Fairbank & Co., at 19th and Blackwell streets. There are two flue boilers in the battery, which has been connected with a special smokestack in order to demonstrate precisely how the device works.

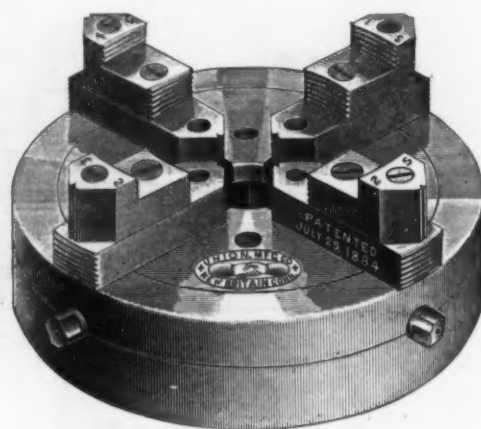
The principle is that of down draft, as indicated above. No steam or air jet is used, nor is any change made in the boiler setting. About one-fourth of the length of the boiler from the front, a number of 2 inch water tubes are attached to the boiler and brought forward to form a fire box, being connected at the front with a 6-inch tube to secure circulation. In the back part of the fire box thus formed a brick wall is built up solidly to the boiler, cutting off all draft in that direction. The smoke and other products of combustion are drawn down through the bottom of the fire box and are then deflected by an inclined wall along the bottom of the boiler in the rear. Below the fire box is a second grate, which catches live coals as they drop between the water tubes above, together with unconsumed coal, and a sub-fire is thus maintained, which is always in a state of incandescence, the coal being fed only in the fire box above. The result of this combination of fires, together with the down draft, is that combustion is as nearly perfect as it appears possible to get it. Even with the poorest quality of slack coal, and no special care by the fireman, the chimney shows no smoke of any consequence escaping, except for a few seconds when fresh coal has been put on the fire. The difference between the appearance of the top of this smoke stack and that of others in the vicinity is very great, the smoke issuing from it being as light as though anthracite coal was the fuel used. The saving in fuel is as yet a matter of conjecture, but no question exists as to a very material saving being accomplished, since the fuel is so thoroughly consumed.

The construction of the Hawley furnace further assures protection to the crown sheets of the boiler, as the flame does not impinge directly on them, but is conducted to the other portions of the boiler, distributing its effects more evenly than by the common method of firing. The cost of this furnace, including royalty to the patentee, is placed at about \$400 for boilers of 100 horse power.

The value of the Hawley Smokeless Furnace seems to have been satisfactorily demonstrated at St. Louis, as M. C. Hawley, the inventor, makes the following statement under date of the 9th inst.: "I have made and had in operation all this summer four at the Schneider Brewery, which have made a saving of as much as 800 bushels of coal per month. The American Brewery has put in two more, and I am building four for the *Globe-Democrat's* new building; also four for the Winklemeyer Brewery. I have had one in use there for three weeks and could do the same work with one boiler that two boilers were performing. The new Snisdecke Brewery has given orders for four, and I am promised three for Mr. Wainwright's new building and four for his brewery, when the old boilers will be thrown out; and also furnaces for the new brewery which Mr. Koehlor is building. The Mercantile Club has put this furnace in its specifications for its new club-house. I have clearly demonstrated that the down-draft furnace adds fully 20 per cent. to the power of the boiler, which is a great consideration, especially for tugs, lake and ocean steamers and railroad locomotives, and I am confident that the day is not far dis-



View of Jaw.



Perspective.

### COMBINATION LATHE CHUCK WITH REVERSIBLE JAWS.

tant when I will be able to so clearly demonstrate this that these furnaces will be universally used by all steam users. When this is done the smoke nuisance will be completely abated and the skies overhead will be as clear in a large city like Chicago as in a small village."

### Lathe Chuck with Reversible Jaws.

The Union Mfg. Company of New Britain, Conn. and 103 Chambers street, New York, have recently added to their line a new style of combination lathe chuck with reversible jaws, as illustrated herewith, which they claim has special merit. The jaw is constructed in two sections, as shown in the left-hand views. The upper section is formed with a dowel on the inner surface adapted to fit in a recess in the center of the other section. Through one end of the upper section passes a hole to receive a machine screw fitting in either one of two threaded holes formed in the lower section. When it is desired to reverse the jaw the outer screw is removed and the one passing through the dowel loosened, when the jaw can be swung to its opposite position and the two screws tightened. This change can be made quickly, as the jaws are not separated. These chucks are made in sizes from 6 to 42 inches, either three or four jaws.

### The Adamson Gun.

Regarding this gun our London contemporary *Iron* says:

We have recently been afforded the opportunity of seeing the drawings and the results of testing a new gun which was designed by the late Daniel Adamson, who, it will be remembered, was president of the Iron and Steel Institute. After many years' practical and theoretical study, of the form and material of field guns, and the making of many thousands of recorded experiments with various kinds of steel for gun and boiler purposes, he devised the Adamson gun, which he claimed to possess the following advantages over any other gun: 1. The form and construction of the gun are simpler and less liable to accident. 2. It will fire a shot or shell a greater distance than any other gun of equal caliber and cost, and can be fired from ten to twenty times per minute. 3. Its ball joint or axis enables it to cover a greater range without moving the seating or gun carriage. One Adamson gun is, therefore, nearly equal in effective range to two ordinary guns. It can be made of any bore from 2 inches to 8 inches, and can be rifled to any pattern and be fitted

with any breech piece. These claims are stated to have been fully realized in a field gun recently made and tested at Bofors. In a report on a recent test shooting by two Swedish Government artillerymen with a 3½ inch Adamson gun, and a projectile of 14½ pounds, they say: The gun was fired five times in 20 seconds, and if the man inserting the cartridges in the chamber had had a little more practice, the gun could have been fired very much quicker. An elevation of 25° will carry the projectile 26,250 feet (very nearly five miles). Eighty-five rounds have been fired. Of the trial it is evident that the gun with more than sufficient strength combines great efficiency compared to its weight, and that the mechanism is so simple, and in consequence thereof so easy to manage, that it does not require experts for its handling. The Adamson gun appears to be a simple, cheap and efficient weapon, and least liable to get out of order with any kind of rough service. It can be used with a very inexpensive gun carriage, and with any ordinary or special powder or projectile. It is being introduced by the Adamson Gun Syndicate, 36 Coleman street, London.

The check upon railroad building in some of the Northwestern States is attributed to the hostility of the Farmers' Alliance to railroad interests.

### Reheater for Compound Engines.

F. W. Dean of Cambridge, Mass., recently invented a reheater for use in connection with compound engines for the purpose of superheating the exhaust steam from the high-pressure cylinder before it enters the low-pressure cylinder. The accompanying drawings show the construction, Fig. 1 being vertical section elevation and Fig. 2 a sectional plan. The cylinder A is of cast iron and is provided at the center with an inwardly projecting T-shaped annular rib, A'. On one side is formed a passage, B, communicating with the exhaust pipe B' of the high-pressure cylinder and a passage, C, opening into the pipe C', through which the steam passes to the low-pressure cylinder after having been reheated. The ends of the cylinders are closed by the heads A<sup>2</sup> A<sup>3</sup>, and into its under side are screwed two drain pipes, a. A copper or steel cylinder, D, has its ends closed by heads which serve as tube sheets to support the series of tubes b, which are inserted in the usual way—that is, by expanding their ends. Live steam enters through the pipe E and passes out through the pipe F.

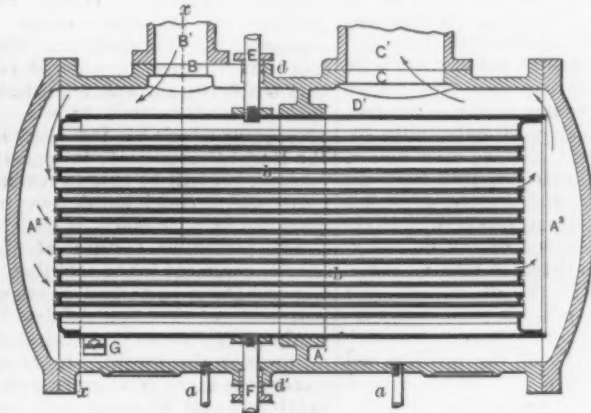


Fig. 1.—Central Longitudinal Section.

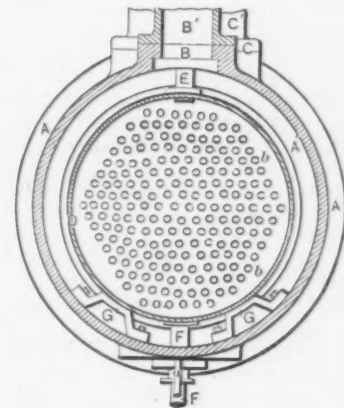


Fig. 2.—Cross Section on Line x x.

### REHEATER FOR COMPOUND ENGINES.

The construction of the cylinders A and D and the heads A<sup>2</sup> A<sup>3</sup> is such that the exhaust steam from the high-pressure cylinder surrounds the cylinder D at the left of the partition rib A', passes through the tubes, surrounds the right-hand half of the inner cylinder, and then passes through the pipe C' to the valve chest of the low-pressure cylinder. In the meantime the interior of the cylinder D has been filled with live steam from the boiler which surrounds all the small pipes, imparting a portion of its heat to them and to the shell of the inner cylinder, which is taken up and absorbed by the exhaust steam. The construction produces a very effective reheater for increasing the pressure and, therefore, the efficiency of the steam in its passage from the high to the low pressure cylinder.

### Freight Regulations.

The Freight Committee of the Central Traffic Association, in session last week at Chicago, took the following action: The present authorized rate of \$2.25 per ton on pig iron and articles taking same rates from Ironton, Jackson, Wellston, &c., to Lansing, Mich., was reduced to \$2.20 per ton. Chicago rates on pig iron may be applied to Benton Harbor and St. Joseph, Mich., from all iron producing points in Central Traffic Association territory east of Indiana-Illinois State line. The committee recommended that a proportional

rate of \$1.25 per ton on pig iron coming from the South be authorized from Cincinnati to Canton, Ill. The committee decided that the present rule of the association which prohibits the consigning of carload freight to agents of railroads in the territory of the association for distribution among several receivers, in order to evade the less than carload rates, should be extended so as not to allow the billing of carload shipments at carload rates to one consignee coupled with instructions or requests in any manner to railroad agents to distribute the same among various parties. It was also decided that railroad agents at points of destination of freight so billed should refuse to make such deliveries except upon correction of the billing, charging the receivers the full L. C. L. rate on such traffic.

### Patent Cases in Court.

An important modification which Patent Commissioner Simonds will urge upon Congress in the practice in regard to patent cases will be a provision for trying interferences in the courts. Important cases always reach the courts, and the decision

proceedings had according to the course of equity, may adjudge whether priority of invention as to the improvement in controversy, in whole or in part, belongs to any of the parties before it, and to whom of such parties priority of invention belongs as to the improvement in controversy, in whole or in part.

When such bills in equity are brought by two or more parties under the same Patent Office adjudication of interference they shall, under the direction of the court, be tried as one cause. When all the parties to the interference are inhabitants of the same judicial district, or of contiguous judicial districts, such suit shall be brought in the district whereof the party first to file his application as aforesaid is an inhabitant; in all other cases said suit shall be brought in the Supreme Court of the District of Columbia, and in such other cases service of papers and process on the adverse party shall be in the district whereof he is an inhabitant, and shall be made by the marshal or his deputy. Such suits shall be appealable to the circuit courts of appeals within 60 days from and after a final adjudication therefor by the circuit court, but not afterward. The final adjudication in such a proceeding on being duly certified by the commissioner shall authorize him to issue the patent or patents, in accordance with the terms of the adjudication, to him or them in whose favor it is made, upon his or their compliance with the requirements of the law in other respects.

When two interfering applications are filed in the Patent Office on the same day it shall

of the Commissioner of Patents is little more than an adjudication of the case upon its *prima facie* merits. Mr. Simonds believes that carrying the case to court at the outset would relieve the Patent Office of a deal of labor which is practically useless. He has prepared a bill for the modification of the patent laws, embodying a number of the reforms which he urged as a member of the last Congress. The provision regarding the decision of cases of interference by the courts is a new feature of the bill, and is important enough to justify quoting its text, which is as follows:

Section 6. That Section 4904 of the Revised Statutes be and hereby is canceled and repealed and the following substituted therefor:

Sec. 4904. Whenever in the opinion of the Commissioner of Patents an application for a patent interferes with another pending application, or with an unexpired patent, he shall give notice thereof to the applicants, or applicant and patentee, as the case may be, and any such party other than the one first to file his application for patent, to whom such notice is sent, who shall not within 60 days from and after the issuance and mailing of such notice show to the commissioner that he has brought his bill in equity, as herein provided for, shall be held not to be the prior inventor of the improvement in controversy. Any person other than the first applicant whose patent or application is thus adjudged to be in interference may bring his bill in equity in the United States Circuit Court against said party first to file his application, as aforesaid, praying for the grant of a patent to himself for the improvement in controversy, and the court, on notice to the adverse parties, and other due

be within the jurisdiction of the commissioner to determine which of them is filed first.

If during the pendency in court of an interference arising under this section an application for patent is filed which, in the opinion of the commissioner, might properly be joined in such interference, the commissioner may, in his discretion, give notice thereof to the court wherein such interference is pending, and if the court consents that such application may be so joined, the commissioner shall allow the applicant 30 days wherein to bring his bill in equity for such rejoinder, and if such bill be not so brought the said applicant shall be held not to be the prior inventor of the improvement in controversy.

If during the pendency in court of an interference arising under this section the commissioner shall discover any patent or printed application material to be considered in determining the patentability of the improvement in controversy, he may in his discretion communicate the same to the court in which such interference is pending for such consideration and action as the court shall deem proper. The second interference shall not be declared by the commissioner upon a new application for patent on the same improvement filed by either party.

This section shall only apply to applications for patents filed after the passage of this act.

The official census returns of the population of Ohio, carefully revised, show that the number of inhabitants in June, 1890, was 3,672,316, a gain in ten years of 474,154, or 14.83 per cent. Cleveland shows much the largest increase in urban population, the gain being 101,207, or 63.20 per cent. Cincinnati gained 41,709, or 16 per cent.

## WORLD'S FAIR NOTES.

### Progress of Work at the Park.

Work on the World's Fair buildings at Jackson Park was delayed last week for several days on account of the rain, but has since been resumed with vigor. Three hundred workmen laid several acres of flooring at the Manufactures Building. The piling and flooring of the 32 acres of foundations will be finished and the structure will begin to assume shape this week. An immense shed has been built on the floor in which to store the staff covering, and a chemical engine with a horse to draw it is housed on the floor for fire service.

All the iron for the Mines Building is on the ground and the iron work will be completed within a week. On Friday the central spans in the arches of the roof were placed and the work of laying the roof is in progress.

The pavilions of the Administration Building are finished to the line of the third story. In the center of the square which they form a tall derrick stands ready to hoist into place the iron work of the dome, the material for which is on the ground.

Iron work for the trusses around the galleries of the Transportation Building is in readiness and the work of raising these trusses will make active progress this week. There will be eight passenger elevators in this building, arranged in octagon form, and running to a height of 165 feet. The frame work of the elevators is being constructed.

The floor of the Agricultural Building is finished, and the lumber is piled up for the superstructure, which will begin to rise this week. The foundations are complete for the Forestry Building. The joists are all in, and the laying of the floor is in progress.

The salt water reservoir for the Fisheries Building is under way. The two aquaria are finished up to the first-floor line, and the arches around the main building are complete.

Fifty brick masons and a large force of carpenters are at work on the Art Building.

The architectural treatment of the shores of the canal and basin is proceeding as fast as practicable.

The Woman's Building looks from a distance like a finished structure, and the south end, with its staff covering, looks like a marble palace. But one-fourth of the whole work is yet to be done, and the entire building will soon be inclosed. The roof is complete with the exception of the trusses over the central rotunda.

### A Permanent Memorial Building.

The location of the art palace, it has been practically decided, will be on the site of the present Interstate Industrial Exposition Building on the Lake Front. This old structure, according to the terms of a city ordinance, granted some time ago to the World's Fair directors, may be torn down after December 1. The new structure is to have its main entrance fronting Adams street, with wings extending equal distances north and south. This building must not be confounded with the Fine Arts Building on the fair grounds, in which exhibitors from all over the world will display their pictures and statuary. The idea is entertained that Chicago, after raising and expending from \$10,000,000 to \$15,000,000, has a right to a permanent structure as a memorial building of the World's Fair. This is what it is proposed the Lake Front Art Institute shall be. Every other World's Fair building, so far as known at present, will be temporary. They will all be located in Jackson Park, and according to the terms of the ordinance granted by the South Park Commis-

mission, must be torn down before January, 1894. Semi-official negotiations have been pending between the exposition management and the commissioners to make either the Fisheries or Horticultural Building permanent, but no agreement has been reached. The downtown Art Palace, according to the plans approved on Thursday last, will be, in the opinion of its projectors, a structure unsurpassed in this country for the purpose intended.

The architects, Shepley, Rutan & Coolidge, are the successors of Architect Richardson of Boston, who designed the Leland Stanford University in California, numerous notable American buildings and a number of private residences in Chicago. Mr. Coolidge is in Chicago now conferring with the Art Institute Committee concerning the building. Bids for its construction will be asked shortly, and as soon as the Exposition Building can be torn down the work of rearing the new institute will begin.

The proposed building is to be 320 feet long on Michigan avenue. The main depth will be 170 feet, with projections, making in all 208 feet in depth. The plan of the structure is that of a parallelogram. The whole building will be constructed of Bedford limestone, with a base of granite. The lower story will be rusticated as far as the top of the first floor. Above this will be a plain band of chiseled stone, and surmounting this will be panels filled with statuary. Surmounting this will be an entablature and cornice richly decorated, the effect of which will be highly increased by the plain surface seen below. The idea of the exterior is to keep the main masses plain and simple, grouping the richness in certain places which are important in the design of the building. These are to be rendered as rich as possible. The roof will be of copper and glass, and will present an ornate and artistic appearance.

The entrance hall will be marble, and the principal feature will be the grand staircase, which is in a cage 50 feet square. This is lighted by a large skylight overhead, and an arcade is formed by arches on all four sides. The marble work of the staircase will be white, and the decoration is to be in keeping with it. The vestibule will be in marble and mosaic, and beyond this is to be the entrance hall, which will be in marble, with mosaic floors and ceiling. The galleries lead out from this from either side, and will be entered through arched openings.

The first cost of the building according to the present plans will be \$600,000. It is expected that later an additional \$200,000 will be contributed by art-loving citizens of Chicago that will be expended for annexes. As the scheme for raising the money now stands it is expected that the Art Institute, through the sale of its present property at Van Buren street and Michigan avenue, will realize \$300,000. The World's Fair directory has promised \$200,000.

During the period of the exposition the building is to be used for world's congresses. As this plan will seat thousands of people in a handsome structure the World's Fair management has felt justified in appropriating the \$200,000. The various halls throughout the city, it was thought by the directory, will scarcely afford sufficient room for these congresses.

### France Asks for Space.

France has made application for 130,000 square feet of space in the Exposition Buildings. The application for space for France was filed Thursday by M. Bruwaert, the French Consul stationed at Chicago. He asked for the following allotment: In the Manufactures' Building, 100,000 square feet; in the Fine Arts Building, 20,000; in the Machinery Hall, 10,000. The Consul also desired space in the Mines

and Mining, Agricultural and Horticultural Buildings. He announced at the same time that France would probably not construct a special building.

### Classification of Foreign Goods.

With the approval of Director-General Davis Chief Allison has made an important decision concerning the classification of goods manufactured in foreign countries. Mr. Allison decides that the agents in this country of articles manufactured in a foreign country cannot have the same entered here as American products. Although the capital of residents of the United States may be employed in the manufacture of such goods, the exhibits will have to be entered as foreign ones and space be assigned for them by the World's Fair Commission of the country in which the articles are produced. A number of the representatives in this country of foreign houses were disappointed by this decision. Mr. Allison said, however, that the fact that the goods which they wished to exhibit had to pay import duty at once classified them as foreign.

### British Exhibitors to Pay for Space.

Exposition officials are greatly surprised to learn that the Royal Commission of England intends to charge British exhibitors for the space which they may occupy at the World's Fair. The surprise was caused largely on account of the fact that Great Britain was furnished free the space which it intends to sell. From the prospectus which has just been issued by the Royal Commission, it appears that the commission will be able to realize on the space which cost it nothing anywhere from \$200,000 to \$334,000.

The particular feature of this which excites comment is the fact that Director-General Davis and Chief Fearn of the Department of Foreign Affairs have been sending regulations concerning the fair to all parts of the world. In these official statements there is a paragraph assuring exhibitors that all space will be granted without cost to those intending to make displays. The question arises as to how intending English exhibitors will harmonize the statements of the exposition management with the charges which the Royal English Commission has announced it will make.

The reason for making the charges the prospectus sets forth as follows:

"As the funds granted by Her Majesty's Government will not suffice to defray all the expense of the section it is necessary that they should be supplemented by payments from the exhibitors. A charge, therefore, will be made to each exhibitor."

Then follows the scale of prices, based on the amount of the space occupied, ranging from 60 cents to \$1.20 per square foot.

The possibility of the money-making features of this scheme will be understood by the statement that Director-General Davis, during the recent visit of the English Commission to Chicago, granted outright 250,000 square feet in certain of the buildings. In addition to this he reserved 45,000 square feet in other buildings, making in all, granted and reserved, 295,000 square feet. Taking the lowest amount—60 cents per square foot—the total realized will be \$177,000. Taking the highest amount—\$1.20 per square foot—the amount will be \$334,000.

It is further provided in the prospectus that if an applicant for space declines or does not notify the commission of the acceptance of space allotted to him, the deposit will be forfeited. Space not occupied seven days previously to the opening of the exposition will be otherwise allotted, and all payments made in respect thereof will be absolutely forfeited.

As all English exhibitors must apply for space to the British Commission, it

remains with that body to deal with them as it may see fit. The thing, however, about which the exposition management is thinking is the fact that it has announced that space would cost the exhibitor nothing. It will not cost intending exhibitors in the United States anything, but if other Governments choose to follow the example set by England it may cost foreign exhibitors.

#### Foreign Countries at Work.

The monthly report of Chief Walker Fearn of the Department of Foreign Affairs tells of the formal acceptance by Austro-Hungary of the invitation to participate in the exposition. To this can now be added the official acceptance of Cape Colony, the Argentine Republic, Algeria, British Guiana, Corea and Bolivia, in most of which countries national commissioners have been appointed.

The International Statistical Institute at their recent conference in Vienna decided to hold their next congress in Chicago in 1893. During the month the first actual exhibits were received in Chicago from Lieutenant Safford in Peru.

The latest report from Japan refers to a change having taken place in the cabinet more favorable to the exposition. There has been a demand on Parliament for \$700,000, where only \$500,000 was the estimate. The government of New South Wales, the oldest of the Australian colonies, has appointed a commission of 53 members.

Consul-General Crawford writes to Chief Handy from St. Petersburg, October 29, that there is a fast increasing interest throughout Russia in the exposition. The publicity given to World's Fair news has increased, and everything relating to it is published in the most friendly and generous spirit. Such a degree of public interest has rarely or never been accorded to any exposition enterprise. The Russian interest in the Columbian Fair is something unprecedented and remarkable for newspapers so proverbially tardy and conservative as the Russian press.

#### First Locomotive Ever Used.

Chief Smith of the Transportation Department is taking every possible means to procure for his exhibit the first locomotive used. He is in receipt of a letter from Thomas Henry Bailey of Merthyr-Tydfil, who possesses a drawing of Trevethick's high-pressure steam engine, which he sent, together with some other objects, to the Paris Exposition. Mr. Bailey will lend the drawing to the Transportation Department of the World's Fair for exhibition. In the matter of tramways he can send two of the old carriages, with a few tram plates and stone blocks upon which to place them. The whole would weigh 3 tons. Mr. Bailey says that he also has at his place, the Plymouth works, an old screwing machine made by Trevethick 100 years ago, and which was at work in their fitting shop till within the last few months. All these things are valuable, and if insurance and guarantee for their safe return are furnished they can be brought to Chicago. The old engine was built partly in Cornwall in the years 1803 and 1804 and was used for the purpose of hauling iron. The rail plates on which it ran were of cast iron about 3 feet in length, with holes in each end for spikes, and resting on stone blocks, the rails being laid so as to form a flange on the inside.

#### Reduced Rates Granted.

Four hundred railroad lines in the United States have made arrangements for reduced freight rates on exhibits intended for the exposition. Two traffic associations, the Associated Railways of Virginia and the Carolinas, representing 10 roads, and the Freight Traffic Association of the Middle States, representing 39 roads, have

during the last month agreed to a free return of State World's Fair exhibits. This leaves but one traffic association to be heard from.

The question of the application of the exposition management for half rates in each direction on exhibits from foreign countries was discussed last week by the Freight Committee of the Central Traffic Association and referred to the managers for their action.

The Government railroads of Russia have agreed to charge on exhibits intended for the exposition 50 per cent. of the regular tariff rates. At the same time the Government "suggested" that private railway corporations make a similar reduction.

It is announced that the German Government will grant half rates over the public railways for exhibits intended for the exposition.

#### Brevities.

The exhibitors at the World's Fair who may require either power or light to conduct their displays must deal exclusively with the exposition management. No charge will be made for a reasonable amount of light and power, but the same must be secured from the exposition management instead of from private companies who may desire to furnish the same. This was agreed upon at a recent meeting of the Executive Committee.

The traveling sidewalk was tested at Jackson Park last week, and the result was altogether satisfactory to the projectors. This traveling sidewalk, in the experiment, consisted of two platforms on the same level, one of which moved at a rate of 3 miles an hour and the other at a speed of 6 miles an hour. The exposition management has allowed the company to construct a loop 900 feet long on the grounds on which to make the test. In case the device should prove satisfactory as a means of transporting people the scheme will be adopted for carrying visitors about the exposition grounds.

The Committee on Awards have decided to hold a session at the Normandie Hotel, Washington, D. C., November 23. This meeting will be for the purpose of putting into shape such recommendations as may be made by the sub committee concerning the amount of the appropriation which should be asked from Congress. No action has been taken in regard to the election of a permanent secretary of the committee. Mr. Hundly, one of the members, will act as temporary secretary until permanent arrangements are made.

Chief Robinson has completed the schedule of department regulations for intending exhibitors in the department of machinery. They have been approved by the Director-General, and will be sent throughout the world as they can be printed.

Last Tuesday it was announced that a syndicate had been organized to construct on the Lake Front a building to be known as the Crystal Water Palace. The structure, according to the projectors, will be located opposite Congress street and be used for an Illinois Central passenger station, as well as a novel attraction in itself. The building is to be constructed of glass and steel, to be hemispherical in form, with a radius of 250 feet. Over the top of the dome will be a constant flow of water and beneath it vari-colored electric lamps, which will give a decidedly spectacular effect to the building.

J. K. Rees, secretary of the American Meteorological Society, 41 East Forty-ninth street, New York, sends us a memorial addressed to the Senate and House of Representatives asking for the enactment of a law making the metric system of

weights and measures the system to be used in the customs service of the United States. He also distributes a large printed sheet showing graphically the size of the different metric measures.

#### The Meyer Recarburizing Process.

In the *Génie Civil*, E. Demenge describes a method of direct recarburizing used by Mr. Meyer, at the Dudelange works, in the Grand Duchy of Luxemburg, as applied to rail steel. Finely powdered anthracite mixed with 10 per cent. of milk of lime is molded by hand into bricks of the ordinary building size, which are allowed to dry for a few months. When the charge in the basic converter is shown to be sufficiently dephosphorized by the ordinary method of testing, the slag is removed, and ferromanganese, with 80 per cent. of manganese, in the right proportion for deoxidizing the overblown metal (0.5 per cent., or 90 pounds for an 8 ton charge), is thrown in, a few minutes being allowed to enable it to melt and diffuse through the mass. During this time the ladle is prepared by throwing in 90 pounds of the anthracite bricks, which are crushed by a rammer and distributed uniformly over the bottom. In pouring the charge, a workman is placed on each side of the crane platform, with a rake covered with refractory material, in order to prevent the slag in the converter flowing out with the metal, and the foreman, by means of the hydraulic mechanism, keeps the ladle slightly on the move both longitudinally and transversely, in order that the jet may impinge upon different parts of the surface successively. A violent reaction and evolution of carbonic oxide takes place when the metal meets the carbon, and for this reason the pouring must be done slowly at first in order to prevent the ladle from boiling over; but at a later period the reaction is beneficial, for the stirring action of the gas promotes uniformity in the finished steel. When the pouring is completed a portion of the slag is allowed to follow, so as to protect the metal against the action of the air, and the teeming into the ingot molds follows at once. The ingots obtained are perfectly sound and compact. A cast intended for rail making of the following composition:—carbon, 0.52; manganese, 0.45; phosphorus, 0.075; silicon, 0.00; and sulphur, 0.013 per cent.—gives a tensile strength of 40.13 tons per square inch, with 18.5 per cent. elongation. The same process has been successfully applied to the production of the hardest steels with 1.5 per cent of carbon. The economy realized is considerable as compared with the method of recarburizing with spiegel, 12 hundredweight of the latter metal, which was formerly required for an 8-ton charge, being now replaced by 1 hundredweight of dry coke, and the amount of ferromanganese required is also reduced by one-half.

G. F. Crivel announces to the stove trade that he has severed his connection with the old foundry supply house represented by him for the past few years, and has taken an active interest in the Chicago Foundry Supply Company, owners of the Peerless Facing Mills, Eighteenth and Rockwell streets, Chicago. The company are now composed of J. S. Hibbs, G. F. Crivel, H. F. Frohman, J. Hill, with J. Wasmer, superintendent, all practical men of long experience in this special line.

The cadets at the Naval Academy at Annapolis, Md., will practice during the coming winter with a 6-inch 35-caliber high-power ordnance rifle which has just been mounted at the academy for their use.

## The Evolution of American Rolling Mills.\*

BY R. W. HUNT, CHICAGO.

As the production of railway bars or rails represents the largest volume of all the many manufactured forms of iron and steel, it is natural that we should first consider mills in which these are made. As most of you know, iron rails were rolled from a pile composed of a number of bars of wrought iron placed one upon the other, brought to a welding heat in a furnace, and then passed between the grooves of rolls, which welded them together, and gradually elongated and formed the mass into a finished rail. In the early days railway engineers were not only satisfied to accept these rails cut in much shorter lengths than now prevails, but, in fact, up to about 1859 would not receive them over 21 feet long. James M. Swank, in his "Iron in all Ages," states that the first rails 30 feet in length were rolled by the Cambria Iron Company in 1855, but there being no sale for them, the rails were placed in the mill yard tracks. He also says the first 30-foot rails rolled to fill an order were made by the Montour Company in January, 1859, for the Sunbury and Erie Railroad Company. I am also indebted to Mr. Swank's work for most of the following dates in relation to the earlier rail mills.

### Early Rail Mills.

The first American rail mill—that is, one built to produce other than strap-iron rails—was the Mount Savage Works, situated in Allegheny County, Maryland, erected in 1843. Rolling began in 1844. Mr. Swank says that in honor of their first rail, which was of the U pattern, the Franklin Institute awarded a silver medal in October, 1844. The rail weighed 42 pounds per yard. Next came the Montour Works, at Danville, Pa. In October, 1845, in that mill was produced the first T-rail made in America. In May, 1846, the Boston Iron Works of Boston, Mass., began rolling rails. June 19, 1846, Cooper & Hewitt rolled their first T-rail in their Trenton, N. J., mill. In September, 1846, the New England Iron Company of Providence, R. I., started rail making. In November of the same year the Phoenix Iron Company of Phoenixville, Pa., rolled rails. In the fall of 1846 rails were made at Brady's Bend, Pa., by the Great Eastern Iron Company, in works built expressly for their manufacture. These works were very extensive, taking the ore and coal from adjacent property owned by the company, and by means of their own blast furnaces, &c., producing the finished product. About the same time the Lackawanna Iron and Coal Company of Scranton, Pa., went into operation, producing rails from their own raw materials. Other mills were built or remodeled to roll rails until in 1850 there were some 15 rail mills in the country, but the commercial conditions were such that the spring of that year saw but two of them in operation.

I have named these early rail mills as matter of history. Some of them are now makers of steel rails in new plants, others are producers of other finished forms of iron and steel, while still others have gone out of existence. In some cases scarcely a vestige remains of a one time great establishment. The mines are abandoned, the blast furnaces have but a few stones to mark their sites, and the rolling mills are so completely wiped out that not a trace of them remains. The once populous

village of busy workers is now monumented by crumbling ruins of their homes. But not so the industry. The United States to-day leads the world in her rail production.

Our subject leads to the history of one of the survivors. The Cambria Iron Works were built in Johnstown, Pa., in 1853, that location being selected because of an abundant iron ore and coal supply; these two minerals being deposited in the same hills, and within a few yards of the selected blast furnace and rolling mill sites. The works were designed to produce iron rails alone. This particular locality had been somewhat exploited since 1809, with more failures than successes.

In view of recent history, I find as a somewhat remarkable coincidence that the first iron works located at Johnstown was a forge, built in 1809, and located on the banks of the Stony Creek, the waters of which were dammed to furnish power for its operations. A flood carried away this dam, and led to the removal of the forge over to the banks of the Little Conemaugh; these two streams uniting at Johnstown, and becoming the Conemaugh. When Mr. Swank made the chronicle, little did he or his readers dream of the greater flood which was to pour down the valley, to which this old forge had been moved for safety, and not only wipe out a large rolling-mill plant, but in addition cause the greatest disaster to life and property known to civilization.

The iron ore which had been used by the earlier establishments, and which led to the building of the Cambria Iron Works, was the outcropping of silicious carbonate. The operations of the smaller plants had been more or less satisfactory, but the consumption of the greater works soon exhausted the outcrop and compelled the use of the leaner ore, which produced iron of an inferior quality. When puddled it was both red and cold short. While the hardness incident to the latter gave good wearing rail heads, the red shortness rendered it difficult to obtain finished rails of which the flanges were not so badly cracked that they had to be thrown on the scrap heap. This happened even after passing through the elaborate system of patching and putting up cracks which then prevailed, and the entire absence of inspection bureaus. Up to July, 1857, all rails at Cambria and other mills were rolled on non-reversing two-high trains of rolls. That is, there were but two rolls in a set, and as they were driven constantly in one direction, the metal which was being drawn into shape by their grooves could be rolled only in that direction. After each passage between the rolls, the pile, or bar, had to be passed back over the top roll, its revolution assisting in this. Of course, quite as much time was consumed in this passing back as in the opposite rolling or reductions. Not only was time consumed and the amount of production limited, but the metal under treatment lost heat, and thus augmented the difficulties in obtaining satisfactory welds of the several slabs of iron composing the rail piles and freedom from "red short" cracks in the finished rail. The difficulties at Cambria continued to increase, and with no other available ore supply, were at last so serious that the prospects of the company were gloomy indeed. But, as has so often and so fortunately happened, the difficulties and seeming hopelessness of the situation forced a solution of the particular case, and more than that, led to an invention which was destined to revolutionize the rail industry of the country.

### The Three-High Mill.

Our esteemed fellow member, John Fritz, was then the chief engineer of the Cambria Company. His keen mechanical perception and good judgment saw the solution of the problem. It was to save

the time and heat lost in passing the bar back in idleness over the top roll; this could be done by adding another or third roll, and so making that which had been the top a middle one. This top roll revolving in the opposite direction to the middle one permitted grooves to be beaded, in which the metal could be reduced as it was brought back to the front of the train of rolls. To accomplish this successfully he invented the Fritz Yielding Hanging Guides and Driven Feed Rollers. This solution seems now such a simple one. But we must remember that at the time of its conception rolling mills were considered old institutions, and their designers and managers thought themselves, and were thought by others, to be very smart men. Moreover, there were difficulties in the construction and operation of this proposed mill which would appear only to those possessed of some practical knowledge. Indeed, some of those high in the councils of the Cambria Company entered solemn and official protests against that crazy man, Fritz, being permitted to waste the company's money. It affairs were badly enough off, as it was, without adding this foolishness.

In addition some of Mr. Fritz's brother engineers and intimate friends compelled themselves, as a matter of fraternal duty, to labor with him against his folly, and thus prevent his scattering to the winds his most excellent and hard-earned reputation. In spite of all, he had the courage of his convictions, and the new mill was built. Let me tell of its start in his own words: "The three-high mill was started on Wednesday, July 29, 1857. We charged and heated six rail piles. We rolled three of them, making perfect rails, when the eccentric of the rail mill engine became hot, and bent the rod badly. Having tried the mill, and all gone perfectly, we stopped, resuming work on Friday morning, and continuing regularly until the usual quitting time on Saturday afternoon. Alexander Hamilton, then and now the superintendent of the mill, and I left the works about half past five in the evening, congratulating ourselves that our troubles, so far as the rail mill was concerned, were practically ended. About seven o'clock that night I heard the mill whistle blow for fire, and at once started for the works, to find the mill in flames from one end to the other. In less than an hour's time the whole structure was consumed. I will leave you to imagine how I felt while seeing in one short hour our best efforts and the labor of a whole year destroyed. But we went at it again, and in about one month's time were again making rails. As almost every person who was supposed to know anything about rolling mills had predicted a failure, the story got out that we had tried the mill, and, finding it a failure, had burned the whole thing down to hide the blunder."

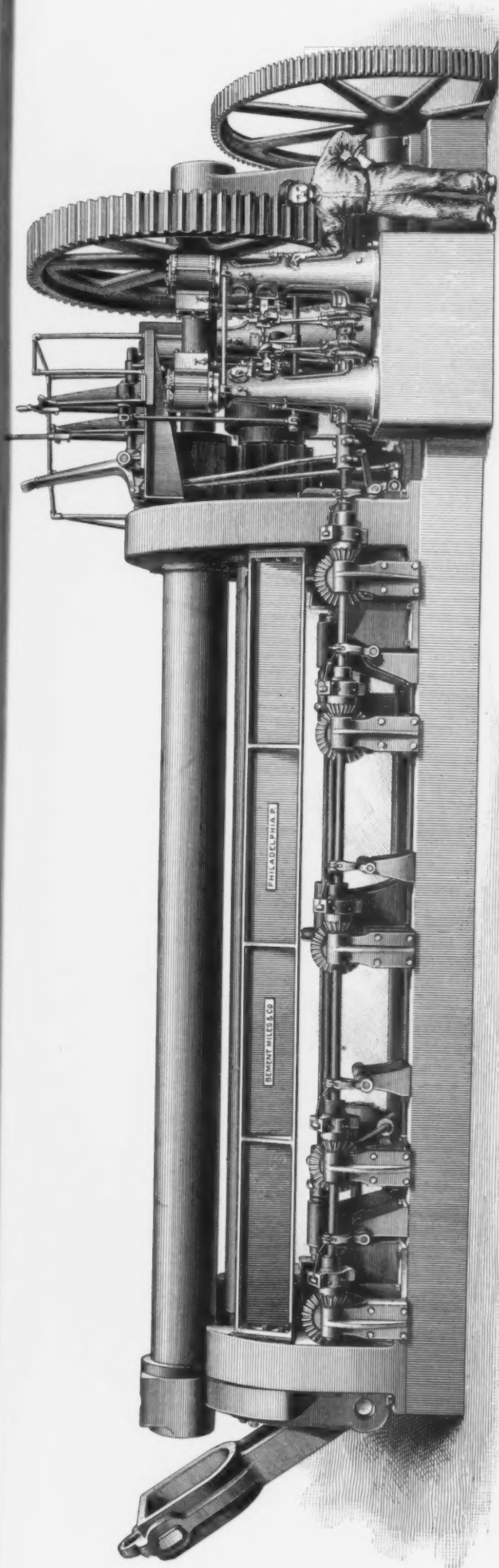
I doubt if ever during Mr. Fritz's subsequent eventful life he has had to carry quite as heavy a mental load. Since then mighty works have grown from his designs, and under his charge. Millions of dollars have been invested on his judgment. The monster steam hammer of the world is his creation; but I venture that while waiting for the shock of its first 125-ton blow, his anxiety was but as that of a child compared to that felt while the first rail pile was passing between the rolls of his 1857 mill. In designing and perfecting this mill Mr. Fritz was assisted by his brother George, who upon John's resignation from the Cambria Company in 1860, to organize the Bethlehem Iron Company and design and build their works at Bethlehem, Pa., succeeded to his position as chief engineer of the Cambria Company.

The Fritz mill was rapidly adopted by the rail mills of the country. Mr. Fritz protected himself by patents, which were

\* Address of the president of the American Society of Mechanical Engineers, New York meeting.





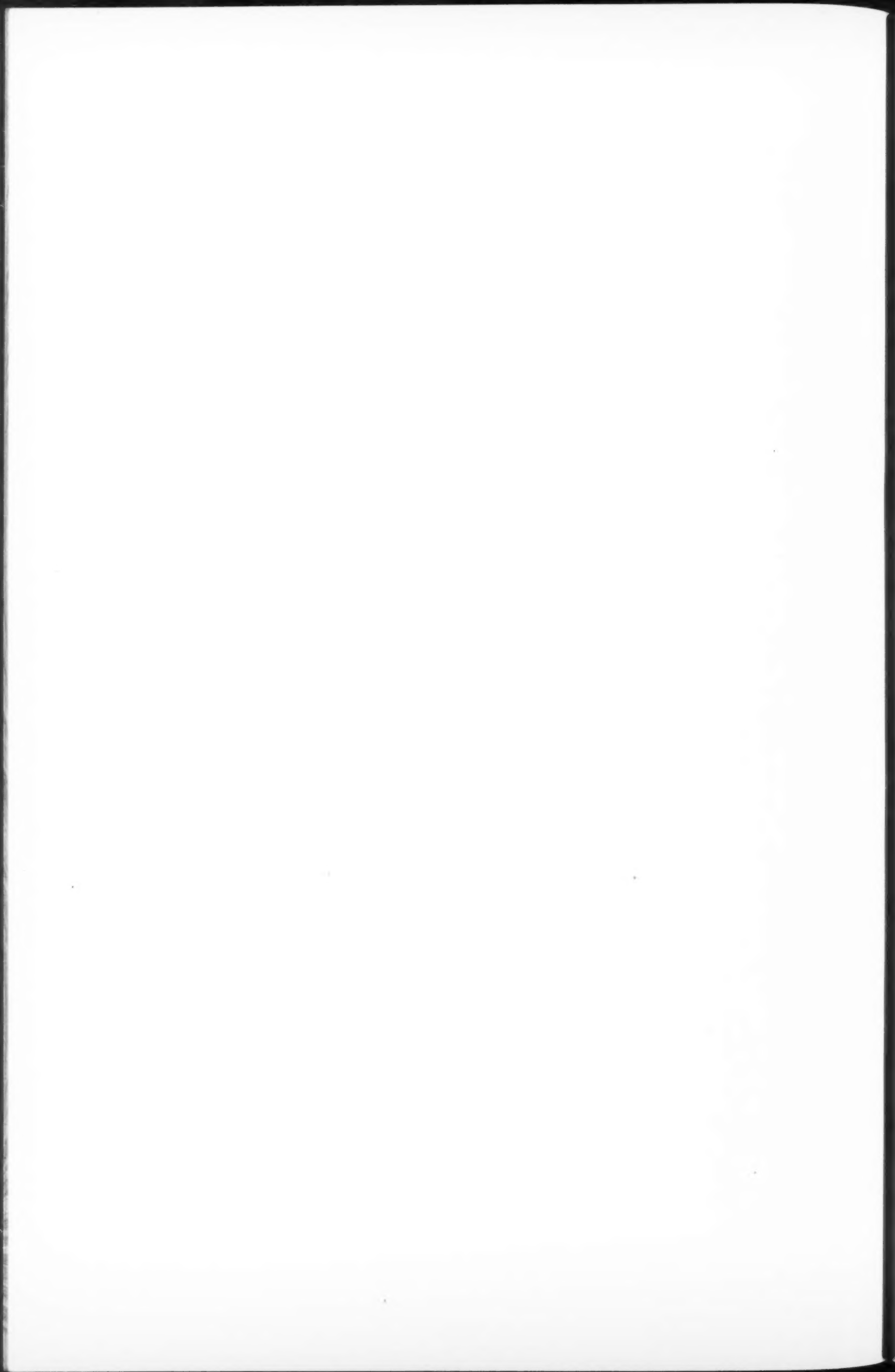


FRONT VIEW.



REAR VIEW.

BENDING ROLLS BUILT BY BEMENT, MILES & CO., PHILADELPHIA.



soon acquired by a combination representing the larger rail mill organizations, under the title of John M. Kennedy & Co. of Philadelphia. In 1864 and 1866 I made in their interest a tour of inspection of all the rail mills of the United States, and found the Fritz mill in universal use. Some had not secured proper licenses, but I believe all ultimately settled. The iron rail industry of America grew rapidly, but as the traffic, weight of equipment and speed of trains of the railroads increased the demand for more enduring rails became imperative. This resulted after a long and busy period of experiments in the invention and adoption of Bessemer steel rails.

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In the early days of iron-rail making the only means of cold straightening the

product was by the blows of a heavy sledge. In fact, I think it was not until about 1856 or 1857 that a straightening press was employed. It is needless to say that the sledge process was slow, and would have been inefficient on heavier sectioned rails of either iron or steel. After the introduction of the cold straightening press the hot bed remained as a weak spot. The rails had to be hot curved against their heads, and to do this by hand, and then drag them down the hot beds by the same power, was both slow and exhausting work. The several mill managements devised various plans to dispense with as much labor as possible in handling the rails from the time they left the finishing pass in the rolls until delivered on the cooling beds. In many mills this was successfully accomplished up to the hot curving. At that point there was a long halt.

In 1875 A. J. Gustin, then the superintendent of the St. Albans, Vt., Rail Mill, invented a rail curving machine, which, together with power appliances for dragging the curved rails down the hot bed, he patented. These devices were soon adopted by many mills. Later William Clark of Pittsburgh invented a rail curver which many prefer to the Gustin. Some mills have adhered to arrangements of their own, but the Gustin and Clark devices may be accepted as the American practice. Without some such arrangements the increase of product which has been so great would have been an impossibility.

Even before the introduction of steel rails a number of inventors had sought to design rail mills which would be practically automatic in their action, but I believe down to the time to which we have traced the art none were actually built. Holley used to say, in that spirit of prophetic jest so constant with him, "That the day would come when we would start a rail mill on Monday morning and then go home after locking the doors, only returning each morning to count the rails that had been made during the preceding 24 hours, no other manual labor being necessary." We have not yet reached that point, but how some of us have mourned that he could not have been spared to see and glory with us in what we have accomplished. He knew it could be done, but for some incomprehensible reason the way did not open to his mind.

#### Automatic Tables.

In March, 1884, I introduced driven tables in front of the finishing rolls of the rail train of the Albany and Rensselaer Iron and Steel Company, Troy, N. Y. They worked so well that, assisted by Max M. Suppes, then the master mechanic of that department, I put an automatic arrangement in front of the roughing rolls. This also was successful. Of course we protected ourselves by letters patent. Later I placed tables on the catchers' side of the train. Captain Wm. R. Jones, then the general superintendent of the Edgar Thomson Works of Carnegie Brothers & Co., at Bessemer, Pa., at once advised his firm to secure authority from me to use my patents. As he proposed a different arrangement for the roughing rolls, he did not care for the Hunt-Suppes claim. The arrangement having been consummated, he constructed an elaborate system of tables, both front and back, all of which he subsequently patented, and we joined interests in the same. As an instance among many of his great heart, he wanted to give me the whole thing, saying: "You were the first to put this matter in a practical shape, and deserve it. I have only gone further with your ideas." Of course I did not accept his proposition, and I know it was to his regret.

Fate sometimes seems too hard to be just. That my friend should have been cut off in the middle of his great life work, and by such a death, was one of those catastrophes the justice of which is beyond human comprehension. Yet I believe he died as he would have chosen—foremost in danger. Often had he risked his life amid shot and shell, and where his example was the incentive to others for higher daring. He escaped hurt or death on the battlefield, but yet to die at what he thought the post of duty. An ardent admirer of Captain Jones, and whose own soldier life had given him a closer sympathy, said, when he heard the details of the accident: "Another general shot on the picket line." This was true, but those who know the history of that fateful afternoon appreciate why he could not be content save at the very front. I know he said to himself: "This company has trusted me; has to-day shown that they appreciate and love me. Their losses are mine, and until I know that furnace is safe I cannot go home." It meant his death; but to him better that than the suspicion of want of devotion. And was he not right? It must come. Better let it find duty overdone than ever so slightly shirked. Please excuse my digression while paying this poor tribute to Captain Jones' memory. It deserves more than I have said. Such men have made, have saved, and will continue to be our nation.

Before the introduction of automatic appliances from 15 to 17 men were required to operate a three-high rail train. The tables of which I have spoken reduced this number to five, including the roller in charge of the train. The next mill to put in automatic tables was the Pennsylvania Steel Company, at Steelton, Pa., in 1884, under licenses from Mr. Suppes and myself. The Joliet Steel Company, at Joliet, Ill., had been experimenting for some with a large-sized working model of an automatic rail mill, from designs of H. S. Smith, general manager; Charles Pettigrew, chief engineer, and F. H. Treat, the latter gentleman being especially engaged upon them. In July, 1885, they altered their blooming and rail mill to conform to the plan, which proved to work as well in actual practice as in experiment. They kept clear of the Jones, Suppes and Hunt patents, except in one particular, and for this they have since taken a license. For some time this mill has been rolling more billets than rails, the practice being to reduce a 15-inch ingot to 4-inch billets at one heat. The product has been brought up to 500 gross tons of such billets per turn, or 1000 tons per day.

The Union Steel Company were reorganized in 1885, after their failure of some years before, and the Bessemer works, blooming and rail mills completely rebuilt by our fellow member, Robert Forsyth. While his company secured licenses from our party, he made radical changes in the arrangement of his tables, and though hampered for want of room, with great success. The new mill started in 1886. He arranged his mill to avoid reheating the rail blooms, although they had to be carried a long distance on driven rollers, from the blooming mill to the rail mill tables, and make two right angle turns in the journey. The Union Mill's best record on standard sectioned rails is, for 24 hours, 1812 gross tons; for month, 28,490 gross tons of rails.

In the same year Cambria remodeled the mill on which the first commercial American steel rails were rolled, and put in automatic tables, designed by Joseph Morgan, Jr., a member of our society. This company have since taken licenses from Jones, Suppes and Hunt. In 1887 the Worcester Steel Company of Worcester, Mass., made terms with us, and added tables to their rail train, which were designed by C. M. Ryder.

#### The Edgar Thomson Mill.

The Edgar Thomson Mill had been doing great work, but neither Captain Jones nor his superior officers were satisfied with being so closely pressed in the amount of rails produced by the Union Works, the South Chicago Works and the Scranton Steel Company. Instructions were given him to build the best rail mill he knew how, regardless of cost. This order was obeyed in every particular, and resulted in the present Edgar Thomson blooming and rail mills. The first rails were rolled in the new mill in 1888. Since then the old mill has been idle.

In designing his new mill Captain Jones made some radical departures. He adhered to the reheating of the blooms after leaving the blooming mill, but caused them to pass through heating furnaces on their road to the rail train. This train he divided into three sets, the first two with three-high rolls, the last with but two, all of 24-inch pitch, each set being driven by its own engine, and provided with automatic tables. In the first or roughing rolls five passes are made. The bloom is then carried by driven rollers to the second or intermediate train, in which it receives five more passes, and is then carried to and through the finishing pass in the two-high set. These trains are placed in echelon and far enough apart to permit three 30 foot rails to be rolled. The mill is a very simple one, and has many mechanical arrangements which make roll changing the work of but a few minutes, while every part of each set of rolls is easy of access. After the rails leave the cambering machine they are carried down the hot bed by power and automatically distributed to the cold straightening presses. This arrangement is simple, substantial and inexpensive of operation.

Since Captain Jones' death some changes have been made, but none of a radical character, and some of them had been foreseen by him. The best product of this mill has been 781 gross tons of rails in 12 hours, 1558 gross tons in 24 hours and 33,181 gross tons in one month. In 1886 the Indianapolis Rolling Mill Company of Indianapolis, Ind., added an open-hearth steel plant to their works and spent considerable money in remodeling their rail mill, and among other things adopted automatic devices for handling the material at the rolls. This was done under the charge of and from plans of D. L. Lentz. The mill worked very well, but commercial reasons soon caused rail rolling to be abandoned, and it has never been resumed.

#### Rolling Girder Rails.

The great progress made in the introduction of street car roads and the increased weight of rolling stock required for the cable and electric systems, as well as the requirements by municipal governments that the intermediate pavement, as well as that outside of the rails, should be of good character, led to the invention of the girder street car rail. The first to secure recognition was the invention of T. L. Johnson of Cleveland, Ohio. These were for some time rolled by the Cambria Company, but the demand increased so rapidly that Mr. Johnson's company decided to build a mill of their own. This was done under the direction and from the plans of A. J. Moxham, the president of the Johnson Company. The mill was located at Moxham, near Johnstown, Pa., and commenced rolling in 1888. Owing to the extremely difficult character of the proposed sections Mr. Moxham decided upon an English two-high reversing mill, importing his engines and train. I think he was wise in his selection of type of mill, as in such a one the piece can be entered while the rolls are revolving very slowly, and if such entry is not satisfac-

tory the mill can be reversed at once and the piece backed out. At all events the works have been very successful. But it must not be inferred that such sections cannot be rolled on three high trains, because it has been and is being done. This at the "Old Mill" of the Cambria Company, the Tidewater Steel Company's Chester, Pa., plant, the North Chicago mills of the Illinois Steel Company, and notably by the North Branch Steel Company of Danville, Pa.

In 1886 the Duquesne Steel Company of Pittsburgh were organized, and located works at Oliver on the Monongahela River, some 14 miles above the city, and about two miles above and on the opposite side of the river to the Edgar Thomson Works. After building a converting and reversing blooming mill plant, operations were suspended. Late in 1887, or early in 1888, a new company was formed under the name of the Allegheny Bessemer Company, and the partially built works were completed by the addition of a three-high rail mill. This was built by Mackintosh, Hemphill & Co., Limited, under license secured from the parties controlling the Joliet table patents, and from the designs of William Clark of Pittsburgh, who was interested in the new company. This mill was composed of two trains of rolls, standing one in front of the other, and back of the blooming mill. Each train had two sets of rolls and was driven by its own engine. Good work was accomplished, but neither the converting works nor blooming mill was able to furnish steel enough to test its capacity. Carnegie, Phipps & Co. have since acquired the works, which are now principally devoted to the making of blooms and billets.

#### The South Chicago Mill.

After the consolidation of the Joliet, Union and North Chicago companies into the Illinois Steel Company, it was decided by the new organization to dismantle their two-high reversing rail mill at the South Chicago works and replace it by a three-high mill with automatic tables, again taking license from us. Mr. Forsyth had become the chief engineer of the new company and built this new mill. In its arrangement and construction he again made changes from anything which had gone before, and his results are speaking loudly for themselves. He divided his rail train into two sections somewhat like the Allegheny Bessemer Works, each having two sets of rolls in three-high housings, and each section driven by its own engine, with automatic tables front and back of the rolls. These trains stand in echelon with the blooming mill, which is a 40-inch three-high train. The rail mill rolls are 27 inch pitch.

In the practice of this mill, as at the Union, the ingots are kept after being cast in a perpendicular position; they are charged upright in gas-fired soaking-pit furnaces of the Hainsworth type, but which are of Mr. Forsyth's own design. After the ingot is reduced in the blooming mill it is carried by power rollers toward the first rail train and through a shear by which the end which was the top of the ingot is cut off and the long bloom sheared in two, each half making two or three rails, according to weight of intended section. The first half at once passes through the rail-roughing rolls, the second one being held for a few seconds, or until the first has made three passes, when it is also sent forward. If from any reason the bloom when sheared should have become too cold to be safely and successfully finished a power overhead traveler is provided to carry it at a right angle into a wing at the side of the mill, in which heating furnaces are located, with a Wellman charging and drawing crane in front of them. When sufficiently heated

the same tool conveys the steel back on to the table rollers.

By this arrangement cold cobbles or other rail blooms can be heated and delivered to the rolls. In the roughing rolls the bloom receives five passes in three-high rolls. It is then passed to the second roughing tables, and is given three passes in three-high rolls. The partially formed section is elevated to the back tables of two-high rolls, and making one pass through them reaches a dummy table in front, from which it slides down on to driven rollers, and is by them carried back to the three-high set of rolls, which are in line with the first roughing rolls and driven by the same engine. In these it receives four passes, making in all 13 rail mill passes. It is now a finished section, long enough to cut into three 30-foot rails. This is done at one operation by four saws. After passing through the cambering machine the rails are carried by power down the hot beds. When sufficiently cool they are loaded by power on to a spider car, which is handled by a special locomotive. The rails are conveyed to the several coal beds, located conveniently to the cold-straightening presses, and are unloaded on to these beds by an automatic arrangement of arms or levers, receiving their power from steam taken from the locomotive boiler.

#### Rail Records.

Up to date the best record of the South Chicago works on standard rail sections is: In 12 hours, 845 gross tons of rails; 24 hours, 1571 gross tons; week, 8152 gross tons; month, 34,381 gross tons. Owing to the depression in the rail market, the Union works of the Illinois Steel Company have not been running steadily for some time, but on October 30, 1891, the mill was rolling light sectioned rails, weighing 35 pounds per yard, and by way of keeping their South Chicago friends from forgetting their existence they took occasion to make a record on such work. The rails were rolled direct from 15-inch ingots, without reheating, and the result was: Day turn, 3298 rails; night turn, 3069; making 6367 rails for the 24 hours, and weighing 989 gross tons. Three hours and 28 minutes out of the 24 were lost from various causes, such as changing passes, dressing rolls, &c. As might be expected, South Chicago soon sought revenge by rolling 3540 rails of 40 pound section in 12 hours. These were also rolled direct from 15-inch ingots.

#### The Sparrows Point Mill.

The last American rail mill to join the sisterhood was the Sparrows Point plant of the Maryland Steel Company, a very near connection of the Pennsylvania Steel Company. These works are situated on Patapasco River, a few miles from Baltimore, Md. They are not yet fully finished, but are designed to be among the best, if not the best, in the country. F. W. Wood, president and general manager of the company, and also the general manager of the Pennsylvania Steel Company, designed them, and he has spared neither money nor brains. The blooming mill is a two-high reversing one, built by Messrs. Mackintosh, Hemphill & Co., Limited. The rail mill is three-high, and consists of three sets of 27-inch rolls standing in line, with a Porter-Allen engine at each end of the train. Either engine is calculated to have power enough to do all the work, but it is intended to employ both. The rolls have automatic tables, and the work is transferred sideways, as in the earlier mills. It is expected to roll long lengths. The Lackawanna Iron and Steel Company have acquired licenses to use the Jones, Suppes and Hunt patents, and I believe propose to put automatic tables in their upper works at an early day.

#### Cold Rolling.

I come now to speak of what may more appropriately be termed a process, because the accomplishment was reached without a special mill. Of course the metal of the rolls and the grooves in them had to be of a special character, but the work was done on an ordinary merchant bar mill. I refer to the cold rolling of iron. This was invented by Bernard Lauth in 1859. His patent was dated August 23 of that year, and the process became a distinctly American one. Jones & Laughlins of Pittsburgh, Pa., acquired the sole control in this country, and derived fame and fortune from it. While a great deal of cold-rolled iron shafting and other articles is still used, the cheapening of steel has caused that metal to largely replace iron, and its greater stiffness has rendered unnecessary its being cold rolled for most purposes.

#### American Plate Mills.

In 1864 Mr. Lauth patented another invention, and that was the three-high plate mill, with the diameter of the middle roll much smaller than the other two. Much of what I have said in favor of the three-high rail mill applies to this type of plate mill, and it soon became the American mill and was also largely adopted in other countries. Mr. Lauth has been a constant experimenter, and has made many rolling mill improvements of great originality and value. His name must always rank high among those who made successful the iron and steel industry of his country. American plate mills have developed in many points, as the greater requirements of steel made more powerful trains a necessity.

The plant of the Otis Steel Company of Cleveland, Ohio, designed and built by our fellow-member, S. T. Wellman, in 1873-74, and started in 1875, afterward added to and improved by him, was for a long time the most complete one in the country. The increasing demand for steel plates, also for armor and other heavy plates, has led to the building of other large mills, notably by Park, Brother & Co., Shoenberger & Co., Linden Steel Company, Spang Steel and Iron Company, &c., of Pittsburgh, and particularly Carnegie, Phipps & Co. of the same city. The latter works possess some powerful mills, which have been lately increased. The universal mill has been largely employed in America, but while the original designs have been added to, I think Wagner of Austria deserves credit as the original inventor. In 1853 Charles Hewitt, since deceased, designed and built for his firm, Cooper, Hewitt & Co. of Trenton, N. J., a beam mill on the universal principle which was a radical departure from all previous plans.

#### Wire Rod Rolling.

Previous to 1869 all wire rods were rolled in this country upon ordinary guide mills, the manipulation of the material being entirely by hand. Billets of about 1½ inches square and 18 pounds in weight were used, and 6 tons of No. 4 rods was regarded as a good day's or turn's work. In the spring of 1869 the Washburn & Moen Mfg. Company of Worcester, Mass., put in a continuous wire rod mill after the design and patents of George Bedson of Manchester, England. On this mill 1½-inch billets were used, but weighing 80 pounds each, and without any manual labor rolled to No. 6 rods. Seven tons of these was considered a satisfactory day's work. Our fellow member, C. H. Morgan, was in charge of the Washburn & Moen works, and he soon discovered that the production of the continuous mill was limited by the reel upon which the rods were coiled as they came from the rolls, this reel being operated by hand. He put in a power reel and was soon enabled to bring the production of the mill to over 20 tons per turn.

A few years later the Roebblings of Trenton, N. J., following a Belgian practice, built a rod mill composed of two separate trains of rolls, the first, or roughing rolls, being of the largest diameter and driven direct from the engine shaft, while the second, or rod rolls, were placed some 30 feet back of the roughing and driven by belt at a much higher speed. This arrangement was much superior to the ordinary mill, but did not dispense with any labor. The Trenton Iron Company of Trenton, N. J., and Washburn & Moen also put in Belgian trains. The Roebblings and the Trenton Iron Company have both greatly improved their mills. In 1876 the Cambria Iron Company built a rod mill after the designs of Henry B. Corner.

While all the rolls of this train were in a continuous line, they were divided into groups, each succeeding one of which was driven at an increased speed, by a line of shafting placed directly under the train. This mill has since been altered and improved. C. H. Morgan constructed another continuous mill for Washburn & Moen, in which many improvements were made, and since he severed his connection with the company the good work has gone on. Rods are now finished on the mill at a speed of 50 feet per second, and reeled with ease and certainty. Mr. Morgan built in 1888 a continuous mill for the American Wire Company of Cleveland, Ohio, on which over 118 gross tons of No. 5 rods have been rolled in ten hours, through a single groove or pass. They have rolled 500 tons per week of No. 8 rods for three consecutive weeks. On the same mill a production of 35 tons per turn for two weeks of No. 9 rods, 0.148 inch diameter, rolled from billets weighing 210 pounds, has been reached. This was a reduction of area of 99.89 per cent. The finished rods were 3620 feet long.

#### The Garrett Rod Mill.

In 1882 William Garrett, a member of our society, then superintendent of the merchant mill department of the Cleveland Rolling Mill Company, Cleveland, Ohio, patented and built a mill which was destined to play a conspicuous part in the American wire industry. The continuous mills were using 1½-inch billets, the Belgian mills 2-inch ones. To produce billets of these sizes it was then necessary to roll the steel ingot to blooms, reheat the blooms and roll to billets. Mr. Garrett's desire was to construct a mill which would take a billet of a large enough section to permit its being rolled direct from the ingot without any reheating. He settled upon 4 inches square as being that size. To accomplish this he went beyond the Belgian mill by putting in three separate trains of rolls, placed in echelon, and driven at progressively increasing speeds. Hence the billet rolls could run at comfortable speed for the workmen to handle the billets without interfering with the speed of the finishing trains. This arrangement not only permitted the use of the larger billet, but made it possible to have several distinct pieces in the rolls at the same time. The present practice is four pieces, and sometimes five rods will be reeled off simultaneously.

Since the Cleveland mill, several other works have put in the Garrett mills, and he has sought to make each last the best. Beaver Falls, Oliver & Roberts, Braddock Wire Company, the Joliet works of the Illinois Steel Company, American Wire Company, H. Nail Company, American Wire Nail Company and the Newcastle Wire Nail Company have put in the Garrett mills. In all forms of mills excepting the continuous advantage has been taken of the device known as the "repeater." This was first patented by John Davis of Cleveland, Ohio. A later one was invented by Mr. McCallup of Columbus, Ohio, and the

last, and by many thought the best one, was invented by Frank G. Tallman, a member of this society. By turning the piece from one pass to another the repeater saves a large amount of labor. On one of the Garrett mills 140 gross tons of No. 5 rods have been made in ten hours, 1300 tons in a week, and nearly 5500 tons in a month. While the advocates of the continuous system admit that greater product can be obtained on the Garrett, they claim a saving in labor and in loss by oxidation. For the average of three years' work, I am given the loss on weight from billets used to finished product on a continuous mill as 2.08 per cent. If there were no differences of opinion, and professional and commercial rivalries, we would be without progress.

#### The Munton Tire Mill.

Among the radical manufacturing departures in rolling mills I would mention the Munton Tire Mill, which is in successful operation at the works of the Chicago Tire and Spring Company, at Melrose, near Chicago. The process which this mill makes possible and the mill itself are the invention of James Munton, the superintendent of the works. He entirely dispenses with hammering in making locomotive or other steel tires. This by the following practice: The ingot is cast with a hole cored out large enough to admit a small roll. The ingot is heated and taken to the rolling mill, where its top, with its imperfections, is sheared off by the rolls, and the bloom left of a given weight. At the same heat and by the same operation the bloom is also roughed out by the roughing rolls of the mill and edged down by horizontal rolls. The bloom is reheated and placed in the tire rolling mill, where it is rolled and finished to the exact inside and outside diameter required. Mr. Munton's mill is so constructed that on it a bloom can be "rolled back" to a smaller diameter. This also applies to a finished tire. Another tire mill embracing several new features and of great power is the one designed and built for the Latrobe Steel Company, Latrobe, Pa., by Julian Kennedy, their chief engineer. The other American steel-tire makers are the Midvale Steel Company of Philadelphia, Pa., and the Standard Company, already mentioned.

During the years of the rolling mill history which I have sought to sketch there have been many improvements made in the construction of all forms of mills, and many sections have been successfully produced on them which were previously thought impossible. I have not attempted to enumerate all of these, but have sought to confine myself to those which have been distinct departures in the roll trains. I have done so because, while many things and men deserve mention, the time required would have gone far beyond the possibilities of this occasion.

#### Rolling Fluid Metal.

I will, therefore, close with a reference to the latest radical departure, which, while not yet quite a commercial success, still has been placed in a sufficiently prominent position to deserve record. I refer to the rolling of liquid steel by Edwin Norton, at the works of Norton Brothers in Chicago. It has been known for some time that Mr. Norton was experimenting in this direction, and in fact had taken out patents in this and other countries. The paper read by Sir Henry Bessemer at the late meeting of the Iron and Steel Institute, on "Rolling Fluid Metal," and which has already been published in several of our technical papers, has called renewed attention to this system of producing steel sheets for tinning.

The commercial changes in the tin-plate industry have been somewhat violent of late, and appearances indicate that the location of a large part of the manufacture may come to this country. At all events, changes which will cheapen the production have become necessary, no matter where the plates are made. The Messrs. Norton are the largest individual tin-plate consumers in America, and as such have naturally kept fully in touch with all phases of the trade. Edwin Norton is the mechanical member of the firm. Some years ago he fully perfected the rolling of soft metals direct from the liquid state into finished sizes. He was fully posted as to what had been attempted in the years past in such rolling. His success with soft metal led him to go further, and strive to do the same thing with liquid steel. He had encouraging results. He protected himself by patents at home and abroad. He felt full reverence for all that Bessemer had given the world, and knew that some 30 odd years ago he had experimented with this very process, and thought he knew wherein Bessemer had not gone quite far enough to insure complete and uniform success. Still, he felt that he deserved recognition. Moreover, Mr. Norton, as a successful American, duly appreciated the advantages which would naturally accrue from having Bessemer indorse and become interested in his process. For these reasons, after protecting himself by patents, he wrote Sir Henry Bessemer; also sending him a piece of sheet which he had rolled direct from liquid metal; explained what improvements he had made, and proposed an honorable commercial relationship. Certainly there was nothing disrespectful in this, no matter how great the man to whom it was made.

Now mind you, up to this time Bessemer seems to have attached little importance to his experiments of many years ago. Messrs. McKinley and Norton recalled them to his mind and gave them value. Perhaps this is none of my business, but Sir Henry has aroused my American ire. He says:

"I received, about two years ago, a parcel from America containing a small sample of sheet metal which was being successfully manufactured there. The person from whom I received it informed me that it was made by a slight alteration or improvement on my patent of 1857, for rolling continuous sheets and thin bars of iron or steel direct from fluid metal. He offered me one-half of his patent if I would undertake its introduction into this country. I did not accept his offer and there the matter rested. The circumstance stated has, however, afforded me an opportunity of showing you a small sample of a continuous sheet produced direct from fluid metal at a single operation and proves beyond doubt or question the important fact that fluid metal may be chilled and formed into a continuous sheet between rolls that are kept cold, while it well illustrates the spirit of enterprise of our American cousins, who are so prompt to recognize, to adopt and to improve upon the inventions brought forward in Europe."

I think he might have treated Mr. Norton a little less cavalierly without any prejudice to his great fame. This thing had laid dead all these years. Should not some honor be given the man who was able to put life into the corpse, and conquer for it a place among live industries? The greatest have always been under obligations to others for portions of their triumphs and always will be. The Bessemer process was a failure for all but the higher purposes until Mushet's invention, and while Sir Henry honored himself by settling an annuity upon Mushet, who at that time had made nothing from his invention, still I for one would have had my already profound respect increased if Bessemer had even mentioned Mushet's name

in his letter giving the history of his process, which was read at the Pittsburgh, Pa., meeting of the Iron and Steel Institute.

We honor you, Sir Henry, and are proud to have your portrait hanging upon the walls of our society house, and hanging in company with that beloved departed member who did so much to create our organization and so much to add to your great fame, but I am not willing that you should have all the credit for the last development in American rolling mills.

## THE WEEK.

Constant addition to the fleet of steamers between New York and New Orleans are necessary on account of the amount of freight offering. Trade with San Francisco by the Southern Pacific Railway is increasing, also with Mexico and Havana.

The Cramps have issued a neat little pamphlet giving a list of the vessels building and recently built for the navy and for private companies, with a tabulated description of them. They state the number of men employed, 3000; total of tonnage under construction, 43,696; total horse power under construction, 76,000; total value of ships under construction, \$14,440,000.

A mortgage for \$6,000,000 just filed in Boston, covering the property of several Eastern cordage manufacturers, bears the names of Waterbury, Wall and other leading firms in New York and New Jersey and grows out of the trust proceedings by which the whole are merged in a single concern.

Strong opposition is making by the Clearfield Bituminous Coal Corporation and other defendants to the proposed foreclosure of the Poughkeepsie bridge.

Robert Gayal, chief engineer of the City of Mexico, is visiting cities in the United States to take observations which may aid him in completing the drainage of the capital. There have been already expended on the work \$3,500,000.

Another ten-story steel frame office building will be erected down town on the present site of the Delaware, Lackawanna and Western Railroad Company, by the trustees of that corporation. It will be nearly square, with a front of Indiana limestone. The interior construction will be on the steel frame work plan used in Chicago's huge buildings and recently adopted by builders of tall structures in this city. The building would stand even if the stone walls were entirely removed.

The phenomenal fact is no iced that the staple agricultural products of this country, owing to the urgent foreign demand for them, are seeking a market more rapidly than the facilities for transporting them permit. This is true not only of inland transportation but of the means of Transatlantic transportation as well. Ocean freights are high, because all the berth room and charters in sight have been engaged for some time to come. The new Russian edict preventing exports of wheat took effect 15th inst., and, like previous ones concerning exports of rye and other products, cannot fail to stimulate the demand for our cereals. Railroads in the wheat belt are beginning to reject orders for grain transportation owing to the lack of cars.

English merchants in the trade with Brazil are more outspoken in their opposition to reciprocity with the United States, and are not wholly averse to revolution.

The stream of immigration has increased enormously between January 1 and August 31 of the year 1891, as compared with what it was in the corresponding eight months of 1890. The number of immigrants all told

for the first eight months of 1891 was 416,570, as against the 335,921 for the same period of 1890, an increase of more than 80,000, or of 24 per cent. Germany and Scandinavia contributed 22 per cent. more than during the corresponding months last year. With this exception "the more desirable element" is missing.

An Alaska explorer who has been for the last seven years in that country, reports finding a copper mine of extraordinary richness. He will endeavor to secure a Government appropriation to assist in opening the trails.

A large movement of corn in the direction of New Orleans is stopped by a temporary blockade.

Louisiana is competing with Florida and California in the orange business. She will grow this year 250,000 boxes.

Five English warships are armed with guns declared to be unreliable, more dangerous to friends than to foes.

No firearms can be imported into China through Hong Kong. A spirit of revolt pervades the Empire. A leading idea is to "make it hot for foreigners."

The Knights of Labor are alarmed by a reported shortage of \$31,000 in the general treasury. They now claim a membership of 270,000.

British manufacturers are beginning to feel the effect of the decrease in their export trade. For the past ten months the decrease has been £12,491,168, and the average decrease £1,125,000 for the month, with the exception of a slight increase in the German demand. In October, 1890, the United States was a customer for tin plates and sheets to the extent of £540,190. Last month it was £178,561. In the articles of food and drink England has bought the enormous amount of nearly £140,000,000, or £6,500,000 more than for the corresponding ten months of 1890.

The greatest movement of wheat ever known in any part of the country, from farm to market, is now taking place in Minnesota and North and South Dakota. The magnitude of the crops of these States has frequently been spoken of. The total yield is estimated all the way from 120,000,000 to 140,000,000 bushels, and some enthusiasts put it at 150,000,000 bushels. There are two great markets for this wheat—Duluth and Minneapolis. In the railroad yards of Duluth one day last week there were 1605 cars of wheat awaiting their turns at the elevators. These cars represented 80 trains, and would make one solid train 10 miles long. The wheat in them would very nearly half fill the largest grain elevator in the land, would load eight large ocean steamers, 12 of the largest lake steamers, and would furnish the flour for a year for the city of New Orleans.

Steam locomotives are to be tried on the Chicago street lines.

Many prominent engineers participated in a discussion of rapid transit at a dinner given by the Commonwealth Club, in this city. Among those present were Charles G. Cronin, secretary of the Rapid Transit League of Harlem; Theodore Cooper, consulting engineer of the Rapid Transit Commission; Walter Katte, chief engineer of the New York Central Railroad; J. J. R. Croes, chief engineer of the Suburban Rapid Transit Company; C. F. Nichols, chief engineer Brooklyn Elevated Railroad; W. R. Hutton, chief engineer Hudson River Tunnel, and W. G. Hamilton, assistant engineer Rapid Transit Commission. Mr. Croes was the first speaker, and was suspected of a leaning toward the elevated system as compared with any other. The cost of the structure,

including property damages in the plan agreed upon by the Rapid Transit Commissioners, he said, would be about the same as that of an elevated railroad, except that in the underground road there would be the additional cost of removing material displaced, which would amount to about \$1,200,000 a mile. H. G. Prout, like several others, was not satisfied that a tunnel could be properly ventilated. Abram S. Hewitt said he favored an underground system, if some great corporation would undertake to do the work. His only objection to the aerial system was its cost. The situation is the same as when he wrote a message on the subject three years ago.

It does not yet appear that the efforts of the Alliance to delay the forward shipment of wheat have had any influence. The receipts at primary Western markets up to a recent date amounted to about 45,000,000 bushels, against 22,000,000 bushels for the same weeks last year. Ever since the second week in July the receipts of wheat have been far in excess of those recorded in any other recent year. Like the Department estimates of cotton production, which proved to be much too small, estimates of the wheat produced are now suspected of being below the actual fact.

The new buildings for students of engineering in the University of Pennsylvania, just commenced in Philadelphia, will accommodate 120 students. The main structure, to be known as Engineering Hall, will be four stories high and will contain the engines and dynamos. The present intention is to have one Porter-Allen and one Straight Line engine of 50 horse-power each, and two compound Westinghouse engines of 100 horse-power.

A water famine in New York is so seriously threatened that the Commissioner of Public Works says many factories will have to shut down unless we have copious rains, but this step will be taken only as a last resort. The danger, he says, has not been overestimated. The old aqueduct, it is noted, is not in use, nor could it be utilized if desired, on account of the low stage of water. In building the new work there must have been a miscalculation somewhere. The proposition now is to build a high masonry dam at the mouth of the Croton River, to cost \$4,000,000, but the needs of the city cannot be postponed at convenience to await the completion of the work. New York has been consuming since the new tunnel was put into service about 140,000,000 gallons of water daily, owing to excessive waste.

Claus Spreckels says the new sugar refinery to be erected in Philadelphia will increase the capacity to 5,000,000 pounds a day, equal to about one-half of the total output of the country.

It is difficult to speak positively of the stirring events now taking place in Brazil on account of the distorting media through which news is communicated, if not altogether suppressed. President Fonseca, since the arbitrary adjournment of Congress, is practically Dictator, the functions of constitutional government being meanwhile suspended. In Rio Grande Do Sul, the most southern State in Brazil, which appears to be the center of disaffection, a provisional Junta has been organized, who are said to have openly proclaimed in favor of revolution. Both the army and navy, if reports can be believed, are divided in their allegiance. The advices received by New York merchants are very indefinite, the writers apparently being influenced by prudential motives. Thus far trade is said to have been but slightly interrupted, although coffee cargoes are detained by the lack of facilities for loading.

# The Iron Age

New York, Thursday, November 19, 1891.

DIVID WILLIAMS, - - - PUBLISHER AND PROPRIETOR.  
 CLAS KIRCHHOFF, - - - EDITOR.  
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 RICHARD R. WILLIAMS - - - HARDWARE EDITOR.  
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## Agricultural Prosperity.

In a brief period, covering the time intervening between the planting and the harvest, a surprising change came over the agricultural outlook not only of the United States, but of two hemispheres, and monetary affairs, considered collectively and in their widest scope, appeared in a different phase. The transition was sudden. Europe and America seemed to have been thrown out of equilibrium, agriculturally speaking, the one being impoverished and the other enriched, so that a readjustment became necessary. This process is now taking place as rapidly as grain-laden steamers can sail, gold being remitted in exchange to rectify the balance of trade. To the United States the subtle revolution thus brought almost through a propitious climate was an unspeakable boon, for while the direct, positive and palpable benefits were manifest in the lavish abundance of products that overspread the fields, the strange coincidence was presented of a market simultaneously opened in Europe on a scale commensurate with the enormous supplies. If Europe looked to the New World as a deliverer, in like manner the farmer, groaning under mortgage indebtedness, hailed the day when he could release himself from the grasp of Eastern capitalists to whom he was bound.

It is only now, since the publication of official documents, that some approximate estimate can be formed of the amount of agricultural wealth represented by the recent harvests. Secretary Rusk of the Agricultural Department, in his annual report, taking as a basis of calculation the official statistics, places the estimated value of farm products in the United States for the year 1891 at \$700,000,000 in excess of the aggregate of the previous year, an accretion of agricultural wealth beyond ordinary conception. Accepting the familiar apothegm that agriculture constitutes the foundation of national prosperity, considered in an economic sense, there is no room for doubt that the finances of the United States rest on a substantial basis. The Secretary points to the fact that during the first three months of the present fiscal year our exports in cereals alone have aggregated \$76,000,000, and the outflow is sure largely to surpass that of any previous year. The demand at the present time is checked only by the scarcity of vessels, which are engaged for months ahead at all the principal ports. Advanced rates of freight operate as a retarding influence, but this difficulty will work its own cure by attracting higher unemployed tonnage

from all parts of the world. One effect of the temporary check is reduced supply of commercial bills, giving more firmness to the rates of exchange. Some disappointment is expressed that the purchase of manufactured goods by farmers and Southern planters is not on a more liberal scale, but it is remarked on the other hand as a healthful indication that large amounts of money are being applied to the lifting of farm mortgages.

Among new factors in the situation that will soon gain prominence is the enormous volume of corn and cotton to be forwarded for export. The latter is already being marketed with much haste and all signs point to a crop much larger than recent estimates. According to Western advices the shortage of cars to move the grain is becoming more pronounced every day and the railroads are choked with freight that they cannot ship. The Chicago, Burlington and Quincy has given notice that it can take no more grain billed to Chicago, as there are now over ten miles of loaded grain cars on its tracks. Other roads are similarly embarrassed, though less in degree.

With such prospects for active railroad transportation all through the winter months as the foregoing survey would point out to be inevitable, orders for new rails and equipment will naturally follow, quickening the iron industry in all its departments. The improved investment demand for railroad bonds is a hopeful augury and the development of the resources of the country is bound to go on.

## Limiting the Height of Chicago Buildings.

The sentiment among all classes of business men in Chicago is plainly in favor of the restriction of the height of buildings in that city. It is felt that too much latitude is given by present building laws, and that considerations of public convenience, health and safety demand that a limit should be fixed. There appears to be no special interest opposing the limitation of the height of buildings, so that the adoption by the city authorities of a maximum height would seem to be an easy matter. But this is not the case. A decided diversity of opinion exists among those who are directly connected with the building interests. Some are in favor of a limit placed at so high an altitude that it is practically not a restriction, while others name a height so much lower that a sharply defined issue has arisen between them. Meanwhile the City Council is assiduously endeavoring to ascertain from the opinions given by presumed experts what a proper and reasonable limit should be, in fairness to the whole people. To show the character of the problem pressing for solution, the following table is given of altitudes of the highest buildings in the city now erected or in process of completion:

	Feet.		Feet.
Chamber of Commerce.....	200	Home Insurance.....	178
The Rookery.....	164	Manhattan.....	210
Monadnock.....	215	The Fair.....	241
Northern Hotel.....	168	Cook County Abstract.....	211
Women's Temple.....	180	Tacoma.....	165
Masonic Temple.....	254	Unity.....	20
Ashland.....	215	Auditorium Tower.....	246

This list of high buildings will be considerably increased during the coming year, as building permits have already been taken out for a number of "sky scrapers," whose projectors desired to anticipate the passage of an ordinance limiting the height of future structures.

The Real Estate Board of Chicago, composed of the leading real-estate brokers, took the subject under consideration, and after a very thorough investigation, and after hearing the opinions of engineers, medical men, architects and other persons whose views would have a practical bearing on the matter, they decided, on the 4th inst., in favor of the passage of an ordinance limiting the height of office buildings to 180 feet, or 14 stories; of mercantile buildings to ten stories, and of family hotels and apartment houses to 100 feet. Efforts were made by some of the members to restrict buildings to a height not greater than twice the width of the street on which they are located, but this plan did not meet with sufficient favor to secure its adoption, although very strong reasons were given in its support, which would seem convincing to most persons.

The Illinois Chapter of the American Institute of Architects is clearly at odds with the Real Estate Board, as its members have voted by a very large majority in favor of restricting the height of buildings to 125 feet, a resolution adopted at a recent meeting reading as follows:

*Resolved*, That after the passing of the necessary constitutional laws and ordinances, any building erected in this city, except grain or coal elevators or sugar refineries, shall not exceed a height of 125 feet from sidewalk grade to highest point of outside wall or flat roof; a pitched roof, however, pitching from all sides, may be permitted to extend above this line at an angle of not more than 60°. The above proposed ordinance is not to include such strictly ornamental features as towers, domes, spires, cupolas or turrets, which may extend higher, provided they are fire proof, nor apartment houses or family hotels, which in no case should exceed 100 feet.

The action of the architects, who may be termed "low-limit" advocates, is rather severely criticised by those who favor the action taken by the Real Estate Board, or "high-limit" people. The latter claim that the architects are discrediting their own work as shown in the high buildings above enumerated, all of which greatly exceed the limit named by the architects. These structures are asserted to be the pride of the city, representing the greatest development in the building arts, if not in architecture, of the century. To fix a limit so far below their height is asserted to be a reproach against them, at least by implication.

The most notable manifesto against high buildings, however, was that adopted by the Builders' and Traders' Exchange of Chicago at a meeting held on the 14th inst. This body is composed of builders, contractors, master carpenters, master plumbers, master painters, dealers in building materials, &c. They passed a resolution recommending to "the Committee of the City Council having charge of this question the introduction and passage of such an ordinance as will serve to remedy

what we believe to be a growing evil," but did not name a limit, leaving that to the discretion of the committee. They accompanied the resolution with a statement of their reasons for favoring the restriction of high buildings to reasonable limits, in which they took strong grounds against the present methods of building in Chicago—namely, the employment of iron and steel for frame work with a veneering of fire-proof tile and terra cotta. This style of building has been considered peculiarly a Chicago departure, whose introduction has done much to improve the architecture of that city, and such an attack was hardly looked for. The high buildings erected after this style are called "skeletons on stilts," and statements are made as to their lack of strength to justify the strict inspection of buildings which the Builders' and Traders' Exchange deem absolutely necessary.

The points being brought out in this discussion are proving to be of widespread interest and great importance. The matter has gone much further than was at first expected. Questions are now handled with boldness which were at first but lightly touched upon, for fear of exciting apprehension among the citizens generally regarding the stability of these huge structures. It would not be remarkable if the result of this outpouring of professional opinion and expert testimony should be the limitation of buildings to a lower height than any yet formally recommended, coupled with most stringent regulations as to inspection.

#### Cellulose For Water-Line Protection.

We have during the past twenty years seen various types of war ships designed, admired and then after being held up for a few years as models, forced to give way to something newer and more nearly like the ideal. In other words, the costly battle ship of the day is more a theoretical structure than the result of experience gained in handling its various engines of destruction in actual warfare. All are waiting for the much talked of war to become a reality, in order that many of these theories may be exploded and our eyes be opened to some important features in which we are now, no doubt, very deficient. It is thought that the question of water-line protection will be one of the greatest importance, and one in which unexpected developments may be looked for.

When our three battle ships were designed the specifications for their construction included a clause as to the employment of some water-excluding material about their hulls, and mentioned woodite as the best known at the time. France has, however, used cellulose with most satisfactory results, and, up to the present, has enjoyed almost the exclusive control of its manufacture.

The naval authorities are discussing this question most earnestly, and have gone so far as to adopt it for the *Detroit*, recently launched at Baltimore, for her sister ships

—cruisers 9 and 11—and for the *Massachusetts*, *Indiana* and *Oregon*, the battle ships. As these vessels are to be built of material of domestic manufacture, and as the control of such material in war times should be within our own territory, it is proposed to at once establish a factory in this country and build it up with the aid of Government patronage. Whether the material used be cellulose, or something that has yet to be discovered, it is certain that the idea is well worth our adoption. If a suitable material can be found which will even partially fulfill the conditions of a water excluder it will be certain to greatly prolong the life of our war ships in action. In comparing it with the present alternative, that of a minute subdivision of the water line into compartments, it is very much to be preferred, as the enemy's projectiles have but little effect upon it, outside of the immediate space that the shots strike, whereas several of the compartments would be knocked into one as a result of the machine gun fire.

The general appearance of cellulose is that of brownish meal mixed in with small grains, and the way that it first came into notice was purely accidental. During target firing by a squad of French sailors the officer in charge was particularly struck with the peculiar manner in which the bed of a floating target that was filled with cocoanut husks closed the holes made in it by the bullets. As the waves washed up over the platform but little water entered, as the husk fiber filled up the bullet holes almost immediately. A series of experiments followed this important discovery, and resulted in the formation of a company for manufacturing cocoanut fiber into the material at present on the market.

The principal characteristics of the cellulose are its lightness and elasticity, and in addition its peculiar non-absorbent features. It has been frequently criticised as being unhealthful and as a vermin breeder. Also that on account of the glucose not being completely removed during its preparation decay and noxious gases are inevitable. As an offset to these criticisms it is only necessary to show by the increasing number of vessels using it that it is growing steadily in favor. In some cases it is used in the form in which it is originally made, in others there is cocoanut fiber added. The material is frequently pressed by heavy machinery into little hollow bricks, the sides of which are not over  $\frac{1}{4}$  inch in thickness. Into the space thus formed additional cellulose is closely packed. This compression contributes the additional feature of non-inflammability, which is not the least important of its recommendations. A cubic foot of the ordinary material weighs between 7 and 8 pounds and the briquettes somewhat more than 8 pounds.

In its practical application more or less trouble has been caused when the material comes directly in contact with the steel plating of the vessels. The French experiments in this particular have been guarded with almost absolute secrecy, like the majority of their tests with warlike

material of almost every description, no matter whether of little or great importance. This much is, however, known, they use a paint which is placed on the steel, and which, while it protects it from the trouble alluded to, also keeps out dampness, and so adds to the life of the cellulose. As to its practical efficiency as a water stopper, a case happened during the past season of maneuvers in which a French torpedo boat was run into and sunk by the French cruiser *Surcouf*. The latter sustained quite serious damage, a hole 1 foot long being made in her bow; and, while her pumping arrangements might have kept her afloat until repairs could have been made, it was found that her cellulose protection was sufficient to almost entirely exclude water.

Its efficacy as a protection against penetrating projectiles is well borne out by the tests made in Denmark. Their latest cruiser, the *Hecla*, was selected for the trials, which, as will be seen, were of a decidedly practical nature. The *Hecla*, built of steel, and provided with numerous water-tight compartments, was fitted with a belt of cellulose 3 feet in thickness. She was anchored in the sound, and a second man-of-war, the *Absalom*, approached to within a distance of 30 to 35 m., and fired a shot from a 5-inch gun into the *Hecla*. The target was a parallelogram marked out on the port side of the latter vessel, a short distance abaft her bow. The projectile penetrated both sides of the *Hecla*, making a smooth hole through the steel plates on both bows. Immediately after the firing of the shot the *Hecla* got her anchor and, starting ahead with her engines, was soon cleaving the water at a gait of 16 knots per hour. During the trip the water, as is usually the case with the ram-bowed ships when going at anything above moderate speed, rose in a wave that went high up on the bows, completely covering the shot holes. The effect of the cellulose, which expanded as the water entered the compartment, was very satisfactory, as only 60 c. cm. of water were found at the end of the run, which lasted three hours.

Another very important feature arises when we consider what the effect of this water-excluding material will be upon the stability of the ship in which it is used. Charles Hemje, in a recent paper published by the Naval Institute, has gone into this question very extensively, and says that if instead of having a vertical water-line belt an inclined belt bounded by an inclined bulkhead be used, the amount of water-excluding material about the same in the two cases, there is, owing to the more suitable disposition of the material, no loss of buoyancy, water-line area or metacentric height. Inasmuch as all weights in modern ships must be kept down to a minimum, stability or water-excluding belts should be so constructed as to get the greatest possible benefit from the smallest quantity of material.

In considering the entrance of comparatively small quantities of water above the slopes of the protective deck, Mr. Hemje says: "It is apparent that popular opinion

regards the case only as one in which a small loss of buoyancy is the worse result, whereas the danger is likely to be critical, not from loss of buoyancy, but from the effect of the small quantity of water on the stability." It therefore becomes imperatively necessary that some means should be adopted for keeping out as much of the water as can possibly be done. Under the terrific fire of small arms and machine artillery it is no longer a possible thing to stop leaks from without by sending men over the side, as was recommended in the old days of muzzle loaders, consequently the damage must be repaired from within, and the more automatically this can be done the better. As answering the latter requisite nothing has been found as satisfactory as cellulose.

Experience shows that coal cannot well be made to serve the two purposes of protection to the machinery and other vitals and at the same time be available for propulsion. If we keep it in the bunkers as an additional defense, we cannot strike it down below for use in the fire rooms, and the steaming efficiency of the cruiser is just that much impaired. Of course, if we adopt the other alternative and burn the fuel the result is quite apparent. All ships should be designed to have as great a metacentric height as is consistent with proper behavior in a seaway and steadiness as gun platforms, so as to insure their standing some water-line punishment from an enemy's fire without having their own stability affected to the extent of rendering their guns innocuous. It seems as though this could be accomplished in no more satisfactory way than by introducing a complete belt of cellulose behind that portion of the plating at the water line and surrounding the vitals.

#### Engineer Gottlieb on Foundations.

The Western Society of Engineers held its regular monthly meeting on the evening of the 4th inst. at No. 78 La Salle street, Chicago. The paper of the evening was read by A. Gottlieb. It was a defense of his work in putting in the foundations for the World's Fair buildings at Jackson Park, disagreement in regard to which with the Chief of Construction and other World's Fair authorities led to Mr. Gottlieb's resignation as Chief Engineer of the Columbian Exposition.

Mr. Gottlieb gave a detailed account of the preparation and tests made preliminary to driving the piles for the foundations, and claimed that his calculations in regard to the tensile strength of various woods and the load-carrying capacity of driven piles tallied with those made by the best engineering experts, and were beyond question safe. But he further said that after his calculations had been made, and the foundations had been begun, the buildings were increased in area and the load to be carried by the foundations greatly increased, and this, too, without consultation with him.

The paper was listened to attentively by the large audience present, but no one seemed inclined to discuss the particular phase of the subject presented by Mr. Gottlieb. A general discussion followed, however, on the general subject of Chicago foundations and the reason for the settlement of buildings.

C. D. Purdy, who has had a great deal to do with the foundations for 16-story

buildings, said that he favored the so-called floating foundation, as against the foundation on piles for high buildings. The trouble was that buildings settled unevenly. This was due, in his opinion, to the fact that the load to be borne by each part of the foundation was not accurately calculated. In many of the new 16-story buildings the load borne by the piers and foundations of the building was not as great as in the case of many of the old stone buildings. It had been ascertained that the load actually borne by the foundation of the five-story stone Gossage Building at Washington and State streets was greater than that which would be borne by the new 17-story Fair Building when completed.

#### Bending Rolls Built by Bement, Miles & Co.

[With Supplementary Page of Engravings.]

Bement, Miles & Co. of Philadelphia recently completed two large bending rolls, one for the Newport News Ship Building and Dry Dock Company and the other for the Maryland Steel Company, at Sparrows Point, Md. Our engravings show very plainly the main features of these machines, which were alike, with the exception of a slight difference in size. The adjustment of the two side rolls and of the lower pinching roll is effected by means of the two engines shown in the front view. The upper pinching roll is driven by the two engines shown in the back view. All the adjustments can be made independently of each other, that is, either end of either side of the side rolls can be elevated or lowered as may be desired without changing the position of the other end. The diameter of the pinching rolls is 21 inches, of the side rolls 20 inches, the weight of the four rolls is 84,000 pounds, the total weight of the machine is 300,000 pounds, and it will take in a plate  $1\frac{1}{2}$  inches thick and 15 feet long.

The engines for adjusting the side rolls are 6 x 8 inches, and are mounted quartering. Mounted on the shaft extending along the base of the machine, as shown in the front view, and driven by these engines, are bevel gears. A description of the work performed by one of these will suffice for all, as far as the adjustment of the side rolls is concerned. One of these bevel gears, taking the one at the extreme right or next the housing of the right-hand end of the rolls, it will be observed, meshes with a second gear mounted upon a shaft extending across the machine. This shaft carries a worm, engaging with a worm wheel, the shaft of which carries a bevel gear, which in turn engages with another gear mounted on the lower end of the screw, by means of which the box carrying that end of the roll is raised or lowered. The arrangement for adjusting the ends of the lower pinching roll is similar, with the exception that the adjustment is accomplished by means of a wedge moved in or out under the box. At the left of the front view and the right of the back view will be observed a yoke adapted to pass over and hold the box on the outer end of the upper pinching roll. This roll is self-sustaining when the yoke is swung down free from the box, being so made in order that a plate, after having been bent to a complete circle, may be removed by slipping it parallel with the rolls.

The engines for driving the top pinching roll are 10 x 12 and are also mounted quartering. The driving shaft carries at its outer end at the left in the back view a pinion engaging with the large gear, the shaft of which carries another pinion engaging with the gear mounted on the outer end of the top roll. The two pinching

rolls are connected by two pinions of like size, the pinion on the top roll being keyed to the roll and being driven direct from the engine, as explained. The pinion on the lower roll is provided with a friction arrangement by means of which the extra distance traveled by the lower pinching roll, due to the curvature of the plate, may be compensated for. The adjusting mechanism operating the lower pinching roll and the side roll are thrown into and out of gear with the driving shaft by means of friction clutches. Both engines and all the clutches are operated from the platform, the arrangement being as shown in the engravings.

#### PERSONAL.

William H. Fenner, Jr., former president of the Allen Paper Car Wheel Company, was on Friday last elected to the presidency of the Grant Locomotive Works, an office made vacant by the resignation of E. T. Jeffery, to become president of the Denver and Rio Grande, with headquarters at Denver. A meeting of the Board of Directors was held in the company's office in the First National Bank Building, Chicago, for the purpose of formally accepting Mr. Jeffery's resignation and electing a new president. The members present were W. J. Walson, J. F. Pierson, Morris Sellers, E. G. Keith, W. T. Block, J. H. Wilson and George M. Bogue. Mr. Grant was in New York.

John Birkinbine of Philadelphia, president of the American Institute of Mining Engineers, and Edgar S. Cook of Pottstown, Pa., president of the Warwick Iron Company, spent several days in Chicago last week, visiting the works of the Illinois Steel Company.

E. L. Ford of the Youngstown Steel Company of Youngstown, Ohio, and Frank Hitchcock of Andrews & Hitchcock of that place, sailed for England last week, where they will make a tour of the iron and steel district of that country. It is stated that Mr. Ford will be present at the starting of the new steel plant recently erected by Sir Lowthian Bell, in which some improvements suggested by Mr. Ford have been utilized. It is also believed that the visit of these two gentlemen to England at this time is for the purpose of examining with particular interest the different steel plants in England, with a view of using any information regarding their construction and arrangements in the building of the new steel plant which will probably be located at Youngstown, the building of which has been under consideration for a long time. Definite information concerning the erection of this new plant will probably be obtained when the two gentlemen arrive home from their trip.

Fred. Seaman of the Sheffield firm of crucible steel makers, Hobson, Seaman & Co., is now in this country.

The return from Europe of J. H. Harris of the Worthington Steam Pump Works is expected this week.

James C. Bayles sailed for Europe in the Spree on Tuesday. He is no longer connected with the Spiral Weld Tube Company.

Frank Watts of the Watts Iron and Steel Company, Middlesborough, Ky., has sailed for Europe, and John Reis is soon to follow him. The question of adding a Bessemer converting department to the open-hearth basic, now building, is under consideration.

F. Lehman of Naylor & Co. has returned to this city, from the South, restored in health.

Gustave Boel of the Louvière Works, Belgium, makers of wire rods and steel beams, is now in this country.

## OBITUARY.

EDWARD Y. TOWNSEND.

After an illness of about two months, resulting from heart disease and a general breaking down of his physical energies, Edward Y. Townsend, the president of the Cambria Iron Company, gently passed into his last sleep on Thursday morning, November 5, 1891, at his country residence at Bryn Mawr, near Philadelphia. He was born on October 4, 1824, in West Chester, Pa., and was the son of John W. Townsend and Sybilla K., who was a daughter of Philip Price. He was the fifth in lineal descent from Joseph Townsend (a younger brother of Richard Townsend, who was prominently connected with William Penn in the early history of the Province of Pennsylvania), who soon after the arrival here of William Penn purchased a large tract of land, including a large part of the site of the present town or borough of West Chester, and extending westward to the Brandywine. His early education was acquired in Anthony Bolmar's school at West Chester, which he left when 18 years old to enter the wholesale dry goods house of Wood, Abbott & Co. of Philadelphia. This firm was composed of Richard D. Wood, James Abbott, Josiah Bacon, John Yarrow, and others, and transacted a large and profitable business with the South and West. During his apprenticeship he made many business journeys on horseback through the then unsettled wilderness of the frontiers, extending as far as Santa Fé, New Mexico.

These trips were made alone, and some of them consumed weeks and months. Wood, Abbott & Co. having subsequently dissolved he was taken into partnership in the new firm of Wood, Bacon & Co., where he continued until the acquisition of a large interest in the Cambria Iron Company, at Johnstown, by Richard D. Wood and his brother, Charles S. Wood, when, in 1855, the firm of Wood, Morrell & Co. was organized and he became an active partner in it. This firm was composed of creditors of the Cambria Iron Company, who had twice failed, and it was organized to lease the works and carry on the business for which the Cambria Iron Company had been organized, that of making iron rails. Of the six partners who composed the firm of Wood, Morrell & Co., three took the active management of the business. These were Charles S. Wood, E. Y. Townsend and Daniel J. Morrell. Mr. Morrell removed to Johnstown, and continued to reside there until his death. In 1857 the rolling mill was destroyed by fire, but the lessees immediately rebuilt it and continued the business until 1861, when the Cambria Iron Company were reorganized, Charles S. Wood becoming president, E. Y. Townsend vice-president and Daniel J. Morrell general superintendent. In 1873 the rolling mill was again destroyed by fire and in 1889 the flood came.

Charles S. Wood died in May, 1873. In the same year Mr. Townsend was promoted to the presidency of the company. In this

wide field of usefulness Mr. Townsend's remarkable business qualities had ample scope and they were eminently successful. At that time the company's capital stock was \$2,000,000 and they had a large floating debt. He accepted the presidency on the sole condition that his efforts should be constantly directed to extinguishing this debt and placing the establishment on a sound financial basis. In this, with the assistance of an able board of directors, and by careful, conservative management, he was signally successful, bringing the company up to their present strong condition and enabling them to withstand and recover from the destructive flood of 1889 without embarrassment. That great disaster was a shock to his kindly and sympathetic nature from which he never recovered. The loss of property did not disturb him, but the dreadful destruction of human life and the ruin of so many thousands of happy homes oppressed him so much as to impair his hitherto sturdy physical health. When the news of the Johnstown disaster reached

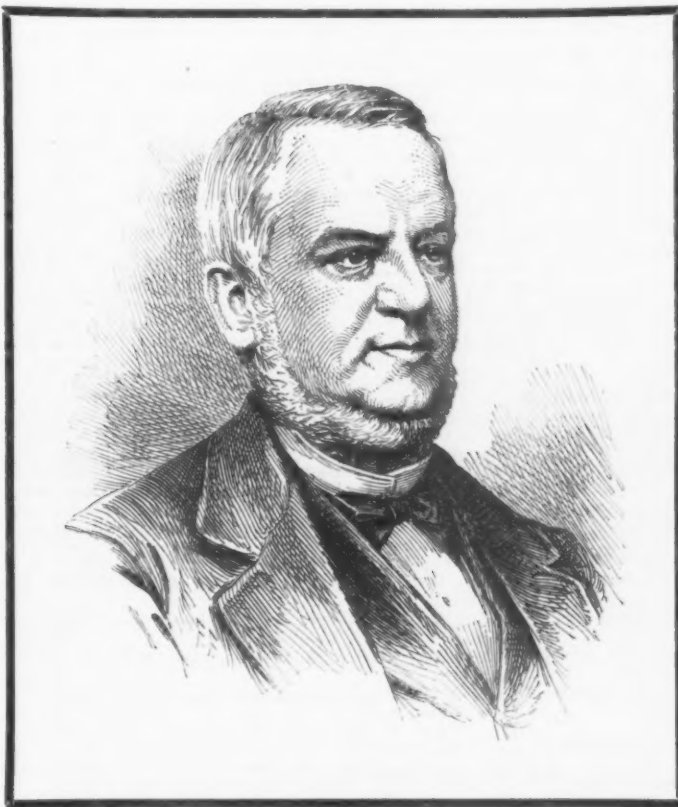
National Bank and the Philadelphia Trust and Safe Deposit Company.

JAMES PENNEY.

Last week James Penney, for 12 years treasurer of the Amalgamated Association of Iron and Steel Workers, Pittsburgh, died at his residence on the South Side in that city. Mr. Penney was much esteemed by his fellow members in the above organization and his loss will be keenly felt. Edward A. Keil has been chosen to succeed to the office made vacant by the death of Mr. Penney.

## Steam Heated Cars.

"The Care of Steam-Heated Cars at Terminal Points" was the subject for debate at the last meeting of the New England Railroad Club, and Mr. Lauder, superintendent of motive power of the Old Colony Railroad, was called upon to open the discussion. Continuous heating of trains from the locomotive has come to stay, was Mr. Lauder's opening declaration, and he continued by saying that it is the desire of all officials to take care of the cars in the most effective manner. The method of heating cars while on the road is already pretty well worked out. The preparation of the cars before starting out is the problem now. Mr. Lauder then outlined the experience of the Old Colony Railroad in its Kneeland street yard. The Old Colony and Boston and Maine roads especially are made up of many branches, and hence there are many points where cars have to be taken care of at night. If straight steam is used the cars can be allowed to get cold, the water condensing in the pipes running off by gravity. But if Baker heaters are used in connection with steam from the locomotive the cars must be kept warm all night or the pipes will freeze up tight before morning. Two years ago Mr. Lauder made a careful estimate of what it would cost to equip the cars of the Old Colony



EDWARD Y. TOWNSEND.

him he hurried from his home, accompanied by a warm friend, J. Lowber Welsh, to the residence of Mayor Fittler, where he met in consultation several members of the Citizens' Permanent Relief Committee of Philadelphia. His princely contribution on behalf of the Cambria Iron Company but in a feeble way indicated the deep and abiding interest he took in the relief of the suffering and distressed. Day after day his entire time and attention were absorbed by it, until the damage done by the flood was repaired and the work of the various bodies representing the State Relief Commission and the country's and the world's charity had been measurably completed.

Dying in the fullness of a well-spent life, he leaves a widow—a daughter of Henry Troth, one of Philadelphia's honored and public-spirited citizens of a generation ago—and two sons, Henry T., president of the Logan Iron and Steel Company, and John W., second vice-president of the Cambria Iron Company. The only other business positions he held were directorships in the boards of the Philadelphia

road and how many additional men would be needed to take care of the cars. He found it would cost \$198,000 just to get the cars ready to be heated, and that 76 men would have to be added to the pay roll.

J. W. Marden, superintendent of the car department of the Fitchburg Railroad, agreed with Mr. Lauder when he said steam heat had come to stay, and his road is satisfied with it. The Fitchburg road has 22 or 23 terminal points where cars have to be taken care of. At Boston and Troy steam plants have been put in, while at other places locomotives are used. When the use of steam heat was first considered, the speaker felt that the matter of taking care of cars at terminal points was an important thing, and he was thus induced to favor the use of direct steam. Last winter the road had only one car freeze up, and that was of the old style equipment. F. D. Adams, master car builder of the Boston and Albany road, said he supposed all present were aware that his road was the first Boston road to use steam heat; in fact, it had a train using steam a year before any road in Boston.

## American Society of Mechanical Engineers.

### NEW YORK MEETING.

The annual meeting of the American Society of Mechanical Engineers now being held in New York is the most important, so far as members are concerned, yet held. Nearly 500 members and their friends are in attendance. Considered from this point of view this is the most successful convention ever held by any technical society in this country, since it means that one-third of the total membership is in attendance. It is to be hoped that the benefit to be derived from the consideration of papers to be presented and the various points of interest to be visited will be in like proportion. The society now has 18 honorary members, 13 life members, 1190 members, 56 associates and 166 juniors, giving a total membership of 1443. During the year there have been admitted 373 members in the several grades, this being by far the largest number ever making application during a single year. The growth of the society, therefore, so far as membership is concerned, is very rapid, and we might at the same time say very healthy.

Among those members who were present during the meeting we may note the following:

- Alden, George I., Professor Mechanical Engineering, Polyt. Institute, Worcester, Mass.  
 Anthony, Gardner C., Director R. I. Technical Drawing School, Providence, R. I.  
 Archer, Edward R., Tredegar Company, Richmond, Va.  
 Ashworth, Daniel, Pittsburgh, Pa.  
 Backstrom, Gustaf Leonard, Philadelphia, Pa.  
 Bailey, W. H., American Tube Works, New York City.  
 Baker W. S. G., Baltimore Car Wheel Company, Baltimore, Md.  
 Baldwin, Stephen W., Penn. Steel company, New York City.  
 Ball, Frank H., Ball Engine Company, New York City.  
 Bancroft, J. Sellers, Manager Wm. Sellers & Co., Incorporated, Philadelphia, Pa.  
 Barr, J. N., West Milwaukee, Wis.  
 Bauer, Charles A., the Warder, Bushnell & Glessner Company, Springfield, Ohio.  
 Beardsley, Arthur, Swarthmore College, Swarthmore, Delaware County, Pa.  
 Benjamin, Park, New York City.  
 Betts, Alfred, Betts Machine Company, Wilmington, Del.  
 Binsse, Henry Leon, Newark Machine Tool Works, Newark, N. J.  
 Bixby, Edgar M., Springfield Foundry Company, 70 Kilby street, Boston, Mass.  
 Blake, Percy M., Hyde Park, Mass.  
 Boies, H. M., Boies Steel Wheel Company, Scranton, Pa.  
 Bole, Wm. A., Westinghouse Machine Company, Pittsburgh, Pa.  
 Bond, Geo. M., Pratt & Whitney Company, Hartford, Conn.  
 Booth, Thos. C., New York City.  
 Borden, Thomas J., Richard Borden Mfg. Company, Fall River, Mass.  
 Boyd, Jas. T., Atlantic Works, East Boston, Mass.  
 Bristol, W. H., Stevens Institute Technology, Hoboken, N. J.  
 Britton, J. W., Britton Iron and Steel Company, Cleveland, Ohio.  
 Brooks, Edwin C., Cambridge W. W. Pumping Station, Cambridge, Mass.  
 Brotherhood, Fred., Phosphate Mining Company, Beaufort, S. C.  
 Brown, Robert A., New Haven Mfg. Company, New Haven, Conn.  
 Bulkley, Henry W., New York City.  
 Bushnell, Fred. N., Providence Steam Engine Company, Providence, R. I.  
 Butterworth, James, Philadelphia, Pa.  
 Camacho, Leopoldo A., New York City.  
 Carpenter, Rolla C., Sibley College, Cornell University, Ithaca, N. Y.  
 Cartwright, Robert, Rochester, N. Y.  
 Carr, C. A., United States Navy, Navy Department, Washington, D. C.  
 Cary, Albert A., Wheeler & Wilson Mfg. Company, Bridgeport, Conn.  
 Charnock, John Milton, South Boston, Mass.  
 Cheney, Walter L., Meriden Machine Tool Company, Meriden, Conn.  
 Christensen, August C., Snow S. P. Works, Buffalo, N. Y.  
 Christiansen, Alfred, United States Arsenal, West Troy, N. Y.  
 Christie, E. W., Colwell I. W., Cartaret, N. J.  
 Church, Wm. Lee, Westinghouse, Church, Kerr & Co., Boston.  
 Clarke, Samuel J., Providence and Stonington Steamship Company, New York City.  
 Clarke, Thomas C., New York City.  
 Clemens, Ernest V., New York City.  
 Clements, Wm. L., Industrial Works, Bay City, Mich.  
 Colahan, Chas., Cleveland, Ohio.  
 Cole, J. Wendell, Detroit Emery Wheel Company, Columbus, Ohio.  
 Coleman, Isaiah B., Elmira, N. Y.  
 Cowles, William, Cowles Engineering Company, Brooklyn, N. Y.  
 Crunksbank, Barton, Indurated Fiber Pipe Company, New York City.  
 Dallett, W. P., Deane Steam Pump Company, Philadelphia.  
 Darling, Edward A., Columbia College, New York City.  
 Davis, Chas H., New York City.  
 Davis, David P., New York Safety Steam Power Company, New York City.  
 Davis, Isaac H., Westinghouse, Church, Kerr & Co., New York City.  
 Dean, Francis W., Boston, Mass.  
 Deane, Charles P., Deane Steam Pump Works, Holyoke, Mass.  
 Delaney, Alexander, Richmond L. & M. Works, Richmond, Va.  
 Denton, James E., Stevens Institute Technology, Hoboken, N. J.  
 Draper, T. W. Morgan, Atlanta and Danville Railway, Portsmouth, Va.  
 Drewett, Wm. A., Davidson Steam Pump Works, Brooklyn, N. Y.  
 Dripps, Wm. A., Philadelphia, Pa.  
 Dudley, Charles B., Pennsylvania Railroad Company and Altoona, Pa.  
 Durfee, W. F., New York City.  
 Edson, Jarvis B., New York City.  
 Ehlers, Peter, Albany.  
 Emery, Charles E., New York City.  
 Engel, Louis G., Brooklyn Sugar Refining Company, Brooklyn, N. Y.  
 Ewer, Roland G., Pennsylvania Salt Mfg. Company, Natrona, Allegheny County, Pa.  
 Falkenau, Arthur, Philadelphia, Pa.  
 Field, Cornelius J., Field Engineering Company, New York City.  
 Fish, Charles H., P. C. Cheney Paper Company, Manchester, N. H.  
 Flagg, S. G., Jr., Philadelphia, Pa.  
 Fleming, Wm. R., W. R. Fleming & Co., New York City.  
 Fletcher, Andrew, W. & A. Fletcher Company, Hoboken, N. J.  
 Fletcher, W. H., W. & A. Fletcher Company, Hoboken, N. J.  
 Foster, C. H., Geo. L. Thompson Mfg. Company, Chicago, Ill.  
 Foster, Chas. F., Heine Safety Boiler Company, St. Louis, Mo.  
 Fowler, Geo. L., New York City.  
 Francis, Harry C., Steam Engineering Company, Philadelphia, Pa.  
 Francis, W. H., Kensington Engineering Works, Limited, Philadelphia, Pa.  
 French, E. C., the Rathbun Company and Deseronto Chemical Works and Gas Company, Deseronto, Ont., Canada.  
 Fritz, John, Bethlehem Iron Company, Bethlehem, Pa.  
 Gantt, Henry L., Casting Department Midvale Steel Works, Nicetown, Pa.  
 Geoghegan, Stephen J., Steam Heating Engineer, New York City.  
 Giles, C. E., Corliss Steam Engine Company, Providence, R. I.  
 Gilmore, Robert J., the Allen Fire Department Supply Company, Providence, R. I.  
 Godfrey, E. S., A. B. See Mfg. Company, Brooklyn, N. Y.  
 Good, Wm. E., Southwark Foundry and Machine Company, Philadelphia, Pa.  
 Goodale, A. M., Boston Mfg. Company, Waltham, Mass.  
 Gordon, Fred. W., Gordon, Stroebel & Laureau, Philadelphia, Pa.  
 Goss, W. F. M., Purdue University, Lafayette, Ind.  
 Gould, W. V., C. B. Rogers & Co., Norwich, Conn.  
 Gowing, E. H., Boston, Mass.  
 Grimm, Paul H., National Starch Company, Glen Cove, L. I., N. Y.  
 Hague, Charles A., New York City.  
 Hammett, Hiram G., Troy, N. Y.  
 Hawkins, John T., Taunton, Mass.  
 Hayward, Fred. H., Williams & Potter, New York City.  
 Hazard, Vincent G., the Pusey & Jones Company, Wilmington, Del.  
 Henning, Gustavus C., New York City.  
 Hershey, Martin E., Harrisburg Car Mfg. Company, Harrisburg, Pa.  
 Hill, William, Collins Company, Collinsville, Conn.  
 Hillmann, Gustav, Brooklyn, N. Y.  
 Hoffecker, W. L., Central Railroad of New Jersey, Elizabeth, N. J.  
 Holland, John, Cocheco Mfg. Company, Dover, N. H.  
 Holloway, J. F., New York City.  
 Hoppes, John J., Hoppes Mfg. Company, Springfield, Ohio.  
 Howell, Edward I. H., Philadelphia, Pa.  
 Humphrey, John, Humphrey Machine Company, Keene, N. H.  
 Humphreys, Alex. C., United Gas Improvement Company, Philadelphia, Pa.  
 Hunt, Alfred E., Pittsburgh Reduction Company, Pittsburgh, Pa.  
 Hunt, Robert W., Robert W. Hunt & Co., Chicago, Ill.  
 Hudson, Winfield Scott, Campbell Printing Press and Machine Company, Taunton, Mass.  
 Hyde, Charles E., Bath Iron Works, Bath, Me.  
 Idell, Frank E., New York City.  
 Jacobi, Albert W., Newark, N. J.  
 Jenkins, W. R., Jenkins & Lingle, Bellefonte, Pa.  
 Johnson, C. R., the Johnson Railroad Signal Company, Rahway, N. J.  
 Jones, Washington, Port Richmond I. W., Philadelphia, Pa.  
 Kafer, John C., Morgan Iron Work, New York City.  
 Kent, Wm., New York City.  
 King, Chas. C. C. W. Hunt Company, West New Brighton, N. Y.  
 Kirchhoff, Charles, *The Iron Age*, New York.  
 Laird, John A., St. Louis, Mo.  
 Lambert, Wilbur C., New Haven Mfg. Company, New Haven, Conn.  
 Lane, Harry M., Lane & Bodley Company, Cincinnati, Ohio.  
 Laval, Geo. de, Knowles Steam Pump Works, Warren, Mass.  
 Leonard, Samuel H., Baltimore Iron Works, Baltimore, Md.  
 Lewis, James F., Rand Drill Company, New York City.  
 Lipe, Charles E., Syracuse, N. Y.  
 Locke, Sylvanus D., Hoosick Falls, N. Y.  
 Loring, Charles H., Navy Yard, Brooklyn, N. Y.  
 Lyne, Lewis F., Jas. Beggs & Co., New York.  
 McElroy, Samuel, New York City.  
 McEwen, J. H., Ridgway, Pa.  
 Main, Charles T., Lower Pacific Mills, Lawrence, Mass.  
 Manning, Chas. H., Amoskeag Mills, Manchester, N. H.  
 Matheson, Wm. G., Acadia Foundry, New Glasgow, Nova Scotia.  
 May, De Courcy, Mt. Airy, Philadelphia, Pa.  
 Miller, Fred. J., *American Machinist*, New York City.  
 Miller, Lebbeus B., the Singer Mfg. Company, Elizabeth, N. J.  
 Miller, T. Spencer, New York City.  
 Monaghan, Wm. F., New York City.  
 Montgomery, H. M., Boston, Mass.  
 Moore, D. G., S. L. Moore & Sons Company, Elizabeth, N. J.  
 Morse, Chas. M., Buffalo, N. Y.  
 Müller, Maurice A., Newark, N. J.  
 Müller, Teile H., Geo. M. Newhall Engineering Company, Philadelphia, Pa.  
 Murphy, Edward J., Hartford Steam Boiler Inspection and Insurance Company, Hartford, Conn.  
 Murray, S. W., Murray, Dougal & Co., Milton, Northumberland County, Pa.  
 Nason, Carleton, W., Nason Mfg. Company, New York City.  
 Nicoll, Chas. H., Newark, N. J.  
 Norton, Harold P., Bureau of Steam Engineering, Navy Department, Washington, D. C.  
 O'Connell, John C., Montgomery Compress Company, Montgomery, Ala.  
 Painter, William, Baltimore, Md.  
 Parker, Walter Edward, Pacific Mills, Lawrence, Mass.  
 Parks, Edward H., Brown & Sharpe Mfg. Company, Providence, R. I.  
 Parsons, Harry de B., New York City.  
 Partridge, Wm. E., New York City.  
 Payne, David W., Payne Engine Company, Elmira, N. Y.  
 Payne, S. F., G. M. R. Shoe Company, Naugatuck, Conn.  
 Pearson, Wm. Anson, Jr., Boies Steel Car Wheel Works, Scranton, Pa.  
 Pentz, Albert D., Des. States Mfg. Company, Newark, N. J.  
 Philp, C. von, Bethlehem Iron Company, Bethlehem, Pa.  
 Phillips, Franklin, Hewes & Phillips Iron Works, Newark, N. J.  
 Phillips, George H., Hewes & Phillips Iron Works, Newark, N. J.  
 Pitkin, Stephen H., Webster, Camp & Lane, Akron, Ohio.  
 Platt, Geo. H., New York City.  
 Ponten, Anders, New York City.

Pusey, Chas. W., the Pusey & Jones Company, Wilmington, Del.  
 Renwick, Edward S., New York City.  
 Richards, Francis H., Hartford, Conn.  
 Richmond, George, New York City.  
 Ridgway, J. T., People's Electric Light Company, Trenton, N. J.  
 Robinson, J. M., New York City.  
 Sargent, John W., Dickson Mfg. Company, Scranton, Pa.  
 Scheffler, F. A., Brush Elec. Company, Cleveland, Ohio.  
 Schuhmann, George, Scott Fdy., Reading I. W., Reading, Philadelphia, Pa.  
 Schutte, Louis, Philadelphia, Pa.  
 Schwamb, Peter, Mass. Inst. Tech., Boston.  
 Schwanhauser, William, South Brooklyn, N. Y.  
 Scribner, Charles W., Ames, Iowa.  
 See, Horace, New York City.  
 Sellers, Coleman, Philadelphia, Pa.  
 Sewall, M. W., New York City.  
 Shaw, T. Jackson, Harlan & Hollingsworth, Wilmington, Del.  
 Shirrell, David, Richmond L. and M. Works, Richmond, Va.  
 Sinclair, Angus, *National Car and Locomotive Builder*, New York City.  
 Slater, Alpheus B., Providence Gas Company, Providence, R. I.  
 Smith, Chas. F., American Engine Company, Bound Brook, N. J.  
 Smith Charles H. L., Union Porcelain Works, Brooklyn, N. Y.  
 Smith, Oberlin, Ferracute Machine Company, Bridgeton, N. J.  
 Smith, Thos. G., Jr., Chas. R. Vincent & Co., New York City.  
 Snow, Wm. W., Ramapo Wheel and Foundry Company, Hillburn, N. Y.  
 Spangler, H. W., University of Pennsylvania, Philadelphia, Pa.  
 Spilsbury, Edmund Gybbon, Cooper, Hewitt & Co., Trenton, N. J.  
 Stearns, Albert, Church & Co., Brooklyn, N. Y.  
 Stewart, Walter Greenway, Reading Pa.  
 Stiles, Norman C., Stiles & Parker Press Company, Middletown, Conn.  
 Stillman, Francis Hill, New York City.  
 Suplee, Henry H., Yale & Towne Mfg. Company, Stamford, Conn.  
 Swasey, Ambrose, Warner & Swasey, Cleveland, Ohio.  
 Sweet, John E., Straight Line Engine Company, Syracuse, N. Y.  
 Tabor, Harris, New York City.  
 Taylor, John T., W. & J. Sloane, New York City.  
 Taylor, Stevenson, W. & A. Fletcher Company, New York City.  
 Thomas, Charles W., Thomas & Schlesinger, New York City.  
 Thomas, Samuel, Catsauqua, Pa.  
 Thompson, Edward P., New York City.  
 Thorne, Wm. H., Wm. Sellers & Co., Incorporated, Philadelphia, Pa.  
 Thurston, Robert H., Sibley College, Cornell University, Ithaca, N. Y.  
 Tobey, George A., U. S. E. L. Company, Newark, N. J.  
 Trautwein, Alfred P., the Hendrick Mfg. Company, Carbondale, Pa.  
 Tremaine, E. G., P. Lorillard & Co., Brooklyn, New York.  
 Underwood, F. H., Underwood Mfg. Company, Tolland, Conn.  
 Upson, Lyman A., Hartford Carpet Company, Thompsonville, Conn.  
 Voorhees, Philip R., New York City.  
 Vose, Clarence, Pratt Mfg. Company, New York City.  
 Wales, Chas. M., Cleveland City Forge and Iron Company, New York City.  
 Walworth, Arthur C., Walworth Construction and Supply Company, Boston, Mass.  
 Warren, B. H., Yale & Towne Mfg. Company, Stamford, Conn.  
 Watson, Wm., American Academy Arts and Sciences, Boston, Mass.  
 Webster, John H., Engineer American Sugar Refining Company, Boston, Mass.  
 Weeks, George W., Lancaster Mills, Clinton, Mass.  
 Weightman, Wm. H., New York City.  
 Wellington, A. M., *Engineering News*, New York City.  
 Wellman, Samuel T., Wellman S. and I. Company, Thurlow, Pa.  
 Wells, J. Leland, Wells & Newton, New York City.  
 Wheeler, F. Meriam, George F. Blake Mfg. Company, New York City.  
 Wheelock, Jerome, Worcester, Mass.  
 Whitehead, George E., Rhode Island Tool Company, Providence, R. I.  
 Whittier, Chas., Boston, Mass.  
 Wiley, Wm. H., New York City.  
 Willcox, Charles H., Willcox & Gibbs Sewing Machine Company, New York City.  
 Winship, J. G., Geo. F. Blake Mfg. Company, New York City.  
 Witherow, James P., Pittsburgh, Pa.  
 Wolff, Alfred R., New York City.

Wood, Walter, R. D. Wood & Co., Philadelphia, Pa.  
 Woodbury, C. J. H., Manufacturers' Mutual Insurance Company, Boston, Mass.  
 Worthen, Wm. H., Guild & Garrison Steam Pump Works, Brooklyn, N. Y.  
 Wright, Louis S., Camden Iron Works, Camden, N. J.  
 Zimmermann, Wm. F., U. S. E. L. Company, Newark, N. J.

#### Opening Session.

The convention was opened at 8.30 o'clock last Monday evening by the annual address of the retiring president, Robert W. Hunt of Chicago, who chose for his subject "The American Rolling Mill," which is reproduced in full elsewhere in this issue. After the reading of the address tellers were appointed to count the ballots for officers, after which the members and their friends partook of a collation and spent the remainder of the evening in social intercourse.

#### First Business Session.

The first business session was held Tuesday morning in the rooms of the society. The report of the council, read by the secretary, Professor Hutton, brought out many valuable points and suggestions. Over \$500 had been received from Providence, that sum being the surplus left over after their expenses for the June meeting had been met. It is to be applied to the Library Fund. Attention was called to the visit of the four representative American societies—namely, Civil, Mechanical, Mining and Electrical, to Europe in 1889, and the desirability of extending an invitation to European engineers to visit this country as the guests of the American societies during the Columbian Exposition in 1893. This point was very favorably received, and it is more than probable that steps will be taken looking toward the accomplishment of this object. A portrait had been received of the late Henry R. Worthington from his son, C. C. Worthington, and hung on the wall back of the platform beside that of A. L. Holley, thus placing prominently before the engineers the likenesses of two of the founders of the society and two who had worked untiringly for its good, and who had accomplished so much.

The report of the Finance Committee showed that the total receipts for the year ending at date were \$19,842.62, but the expenditures had been such that the treasurer had a balance on hand of \$2 and some odd cents. It was further stated that there were only 11 members out of the whole membership in arrears. This simple statement of facts had much to do with the vote afterward taken, which resulted in the raising of the dues. It showed clearly that the income of the society was not sufficient to enable it to go ahead and perform the work it really ought to do in the most satisfactory manner.

When the report of the Committee on Library and House was reached the secretary made a statement which, it is presumed, conveyed much information not known to the majority of the members present. The building is owned by the Mechanical Engineers' Library Association, of whom it is rented by the American Society of Mechanical Engineers. The income of the association is derived, first, from this rental, then by the rent paid by the Electrical Engineers for the third floor, from the rent of the five bedrooms which have been fitted up, and from the payment of \$3 per year by all those who have become Fellows. In other words, all members of the society are members of the association, but only such as pay the \$3 are Fellows. The library is owned and controlled by the association and is a free public institution, open at all times to be consulted by any one. It has been used on

an average by two a day, sometimes there being none and sometimes there being a rush, but the average being about this. Being a free library it is subject to no State or city tax, the only expense of this nature being the payment of the water tax. The library belonging to the society has been loaned to the association, who, it may be said, take care of it, and as part payment allowance is made in the rent for the use of the books thus obtained and controlled by the association. It is to be hoped that some day the society will own the building free and clear.

The report of the Committee on Standards, made by James W. See, its chairman, stated that a bill covering the subject had been introduced into Congress, but that when the last session expired the bill expired with it and nothing had, therefore, been done toward legalizing any standards.

#### Standard Methods of Testing Materials.

This committee is composed of Messrs. Towne, Thurston, Egleston, Morgan and Henning. At the last meeting all available data on this subject compiled by foreign conferences and societies had been presented to the American engineers in translations made by Mr. Henning. The work done by the committee up to that time was then published. Mr. Henning called attention to the fact that there was shortly to be held in Vienna an International Conference of Engineers to consider the question of standardizing specimens and methods of testing. This conference would be composed of German, French and Austrian engineers, and there had been received an invitation that the American society should participate. Mr. Henning was willing to attend the convention as the representative of the American society, charging nothing for his time and services, the society merely paying his current expenses, estimated at about \$250. The desirability of having some one to represent the American society at this conference was strongly dwelt upon by several of the members, as was also the fact that the society, with a balance of \$2 and odd cents in the treasury, was not in a condition to undertake such an outlay. Professor Hutton here reminded the committee and also the society in general that he had the sum of \$155 which had in former times been collected by the committee to forward its work, and that therefore, as this amount was at the disposal of the committee, the only expense the society would be put to would be to pay the additional \$100. Mr. Henning further explained that the reports thus far made related almost solely to scientific work, while the next report would cover the more practical side of the question, and would be devoted to making standard tests in the shop. By having a representative at the conference the standards adopted would, as it might be termed, be interchangeable, and therefore comparable. French and German engineers now work, as far as standards are concerned, on the same basis, but English engineers travel independently of each other and of the rest of the world. American engineers selected what they considered best, and yet had no uniform system. The matter was finally referred to the council with power. There has always been a great hesitancy on the part of the society in regard to placing itself on record as recommending anything in the shape of standards. It was explained that the same view was taken by foreign conferences and that the work they did was not considered as binding either with the societies making the report or on the members, the position of the foreign and home societies being identical on this point.

The Committee on Standard Flanges for Pipe reported progress. It was stated

by a member that the Master Steam Fitters' Association was working toward the same end, having appointed a committee. It was thought that if the committees could combine and hold their deliberations in common the result would be decidedly beneficial, since it would avoid all danger of collision.

#### Dues Raised.

Notice was given at the Providence meeting that certain amendments to the constitution would be brought before the next meeting. The fact had been so clearly brought out in the early part of this meeting that the society lacked funds wherewith to carry on its work that in a certain sense the members were prepared to receive favorably the amendments proposed. It was finally voted to raise the initiation fee for new members and associates hereafter elected from \$15 to \$25, and for new juniors from \$10 to \$15; to raise the dues of members and associates from \$10 to \$15, and of juniors from \$5 to \$10. It is evident that with a membership of between 1400 and 1500 this increase in the dues and in the initiation fees will add most materially to the income of the society.

The proposed amendment to the constitution, stipulating that the Nominating Committee shall submit two names for officers instead of only one, as now, was not carried. It was shown that the present method possessed very decided advantages, and that since the constitution already provided for the placing of separate tickets in the field by any five members, who were at liberty to nominate a ticket of their own, this served every purpose, and it was therefore in the opinion of the meeting not advisable to change the constitution.

#### Officers Elected.

The result of the election was as follows:

President—Chas. H. Loring, Brooklyn, N. Y.  
Vice-Presidents—G. I. Alden, Worcester, Mass.; E. F. C. Davis, Richmond, Va.; Irving M. Scott, San Francisco, Cal.  
Treasurer—Wm. H. Wiley, New York.  
Managers—James M. Dodge, Philadelphia; Robert Forsyth, Chicago; Jesse M. Smith, Detroit, Mich.

#### San Francisco Meeting.

Some time since circulars were sent to all the members asking their opinion as to the desirability of holding the spring meeting in San Francisco. The replies which had been received were as follows: Those who approved the plan and expected to go numbered 177; those who approved the plan and would decide about their going at a later date numbered 273; those who approved the plan but could not go numbered 273. There were exactly 723 in favor of holding the next meeting in San Francisco, against 73 who did not favor that locality or had a preference for some other.

#### Excursions.

Tuesday afternoon was left without any assignment as far as visiting was concerned, the members being expected at that time to do such business of a private nature as they might have. The only general excursions undertaken in a body will be a visit to the Brooklyn Navy Yard on Wednesday morning, and to the De La Vergne Refrigerating Company afterward, luncheon being served on the boat. Invitations have been received for the members to visit the following places of interest: Morgan Iron Works, Quintard Iron Works, North River Iron Works, Pond Machine Tool Works, Plainfield, N. J.; Stevens Institute of Technology, Hoboken; Columbia College, New York; Pratt Institute, Brooklyn; Washington Bridge; Moore & Sons' Ship Yard, Elizabethport, N. J.; World and Equitable buildings; Metro-

politan Museum of Art and of Natural History; Ball & Wood Engine Company, Elizabethport; Harper Brothers, New York; Cable Railway Power House, 125th street; American Institute Fair; Engineers' Club; Newark, N. J., Water Works; United States Assay Office.

#### Papers and Discussions.

The first paper considered at the Tuesday evening session was that by A. F. Nagle on

#### EXPERIMENTS TO DETERMINE THE RATE OF FALL (OR RISE) OF A MERCURIAL THERMOMETER UNDER DIFFERENT CONDITIONS.

This paper may be considered as supplementary to the one on the sensitiveness of automatic sprinklers presented at the Cincinnati meeting. In that paper the rate of fall of a thermometer from a high to a lower temperature was assumed to hold equally good for its rise from a low to a higher temperature. This is not strictly correct in theory, because when a heated thermometer is exposed to a cooler atmosphere it loses heat both by radiation and convection, while in the inverse process, when a cold thermometer is heated by hot gases, it receives heat only by convection and not by radiation. It was therefore determined to investigate further the effect of velocity of current in cooling the thermometer. Tests were made under three conditions:

In the first case the thermometer was heated to 345° F., and allowed to cool in the center of a room at 74° F. without any artificial circulation of air. In this case radiation and convection together reduced the temperature at a rate which gave a constant of 10.5.

In the second test the air was fanned quite violently and gave a constant of 5.90.

In the third test the thermometer bulb was held in front of a 3/4-inch tube, from which issued a violent blast of air, 74° F., generated by a strong foot bellows. This gave a constant of 1.80.

It will be noted that the greatest effect was produced by the velocity with which the cold air impinged upon the heated thermometer. These experiments show that automatic sprinklers, or other bodies to be heated for scientific tests of this character, are so greatly influenced by the velocity of the current of either hot or cold air that unless full cognizance be taken of this fact the results will be of but little scientific value. The paper then describes the two methods of preparing ovens for sprinkler tests—large ovens having a fixed temperature and small ovens with a rising temperature.

The second paper, also by Mr. Nagle, described a

#### TEST OF INDIANA BLOCK COAL AT THE CHICAGO WEST SIDE PUMPING STATION.

There was nothing unusual in the boiler arrangement or in the method of conducting the test. The result showed the water evaporated from 212° per pound of coal to be 9.25 pounds.

In discussing the paper Mr. Kent asked why was the paper presented at all? It merely describes a test of a common form of boiler. Engineers are making similar tests every day. The paper gives no chemical analysis of the coal, and a comparison with the work done by other coals is impossible. The results are not favorable. Better results—greater evaporation per pound of coal—are obtained from anthracite. It is not known to-day what can be done with Indiana block coal.

The third paper was also by Mr. Nagle,

#### LIMITATIONS OF STEAM ENGINE ECONOMY.

The writer recently worked out a table, and plotted the same, which gives the amount of water per horse-power per hour with different degrees of expansion and

under different steam pressure for both condensing and non-condensing engines. It is simply the amount of steam an engine would consume if there were no clearance or waste space, nor any condensation within the cylinder.

The formula by which the results are obtained is very simple, namely:

$$W = \frac{1,980,000}{V \times 144 \times R \left[ \frac{1 + \text{hyp. log. } R}{R} \times P - p \right]}$$

W = Pounds of water per horse-power per hour.

V = Cubic feet per pound of steam pressure P.

R = Number of expansions.

P = Initial steam pressure, absolute.

p = Back pressure, taken at 16 pounds (absolute) for non-condensing and 2 pounds for condensing engines.

1,980,000 = Foot pounds of work per horse-power per hour.

144 = Square inches per square foot.

To illustrate the formula assume a steam pressure of 150 pounds and an expansion 15, condensing engine.

V = 2.996.

Hyp. log. 15 = 2.7081.

$$W = \frac{1,980,000}{2.996 \times 144 \times 15 \left[ \frac{1 + 2.7081}{15} \times 150 - 2 \right]} = 8.83$$

There is added on the diagram the water used by several representative types of engines, and it enables one to study at a glance the lines within which we must make improvements to secure greater economy.

If a triple expansion engine consumes 12 1/2 pounds of water, and the theoretical quantity with the same steam pressure (150 pounds) and same degree of expansion (20) be 8.30 pounds, then the engine has an efficiency of

$$\frac{8.30}{12.50} = 66 \text{ per cent.}$$

A compound engine consuming 14 pounds of water with 105 pounds of steam pressure and 15 expansions would require, theoretically, 9.25 pounds of water, an efficiency of

$$\frac{9.25}{14} = 65 \text{ per cent.}$$

In the discussion Chas. E. Emery said that the quantity of steam necessarily condensed to furnish the heat transmuted into mechanical work amounts by itself to 2 1/2 pounds and upward per horse-power per hour. In addition to this, 1 to 1 1/2 pounds of water per horse-power per hour are required under practical conditions when the clearances are considered, so that nearly 4 pounds should be added to each of the costs stated in Mr. Nagle's table to show the actual calculated cost arising from necessary conditions.

Before presenting the first topical question the president explained that the scarcity of papers at the present meeting was due to the fact that the society was too poor to publish an extended number in the "Transactions." But in the future, owing to the raising of the dues and initiation fees, there would be no cause for complaint.

HAS ANY ONE EVER TRIED TO STANDARDIZE SIZES FOR KEYS? IF SO, WHAT ARE HIS SIZES?

Mr. Parkhurst said that he had, after much experimenting, adopted the following as being well suited to all requirements:

One quarter the diameter of shaft for width.

One ninth the diameter of shaft for depth of key.

One-quarter inch to 1 foot taper.

Another member thought that better results would be obtained by making the width one third the diameter.

It is more essential to accurately fit the top and bottom than the sides. Mr. Barnes described the Woodruff system of keying. This has been fully illustrated in *The Iron Age*.

Mr. Rogers stated that he had been asked four times during the past month by men in his shop for a standard. He had none. He did not like the one-ninth in the standard given by Mr. Parkhurst, for the sufficient reason that the ordinary mechanic, when required to change  $\frac{1}{8}$  inch into  $\frac{1}{16}$  inch, is very apt to get badly mixed. It was afterward pointed out that practically the same standard had been employed by another member, but in sixteenths, in order to eliminate the difficulty pointed out by Mr. Rogers. Mr. Ball here explained a method of keying which he had used with the most satisfactory results. The key is so placed that the curve of the shaft passes through the diagonally opposite corner. The slot in the shaft and the slot in the hub are triangular instead of rectangular in section. This key he had found to work well under the most trying conditions.

The paper by Charles T. Main on

#### THE VALUE OF A WATER POWER

was next presented. The value of a water power depends upon (1) the quantity of water, the fall and the uniformity of flow during the year and for a succession of years. The paper then very exhaustively estimates the value of water powers of various aspects and particularly compares this value with that of steam.

Mr. Emery instanced a case in which a power had been condemned, and in which, in the settlement, the question of power did not enter. It was that of a print works using water. They needed the water itself, and the question of recompense was based on the amount the owners would have to pay the city if they obtained the water through a meter.

The next topical question was:

HAVE YOU HAD ANY EXPERIENCE IN OUT-DOOR WORK AT NIGHT IN WIND AND STORM WITH PORTABLE APPARATUS FOR LIGHT IN LARGE QUANTITIES OTHER THAN ELECTRIC LIGHT?

On the wharves of the Mississippi they use a broom-shaped torch made of hemp and dipped in tar. It gives a big light and a big emoke. Many had used the Lucigen and Welles lights and found them excellent. Mr. Cartwright said he had used the "Dago" light similar to that employed by Italian peanut sellers. He had found that in the neighborhood of Buffalo the globe of an arc light would become filled with "Canadian soldiers" and mosquitoes in two or three hours. The Dago light served a useful purpose since it could not be choked and it burned them up. It was explained that Canadian soldiers are shad flies up North and gad flies in Jersey.

The next paper was a very valuable contribution by Samuel McElroy on

THE BROOKLYN PUMPING ENGINES OF 1860.

The paper not only described the Brooklyn pumping plant, but it also went fully into the history of pumping engines and boilers.

The session closed with the topical question,

WHAT IS THE BEST DESIGN FOR LINE SHAFTING TRANSMITTING OVER 50 HORSE-POWER, PERMITTING THEM TO BE STOPPED AND STARTED ON ANY FLOOR WITHOUT INTERFERING WITH THE MOTOR OR OTHER SHAFTING?

Mr. McBride said that he had machines requiring 50 horse power and upward and he uses tighteners exclusively. He had never had any trouble in starting or stopping. He thought tight and loose pulleys were abominations. Many mem-

bers thought friction clutches worked admirably, but it was stated that while they could always be relied to take hold, they could not always be thrown out. The question of lubricating friction clutches is important. It can be perfectly done by a graphite filled bushing.

## Washington News.

(From Our Regular Correspondent.)

WASHINGTON, D. C., November 17, 1891.

The second series of firings in the tests of ship armor at the United States Naval Ordnance Proving Grounds took place on last Saturday in the presence of a distinguished party of officials, experts and journalists. The guests were conveyed to the scene of the trials on the United States dynamite cruiser Vesuvius, United States coast survey steamer Blake, United States steam tug Triton, and steamer James Moseley, and numbered about 80. Among the prominent personages present were Secretary Tracy and Assistant Secretary Soley, Commodore Folger, Chief of Bureau of Ordnance, United States Navy; Major-General Schofield, Rear Admiral Kimberly, Senators Morrill and Hawley, General Flageler, Chief of Ordnance; Captain Shaler, Ordnance United States Army; Solicitor General Taft, and others of the civil, military and naval arms of the service. The *attachés* of a number of legations of foreign governments were also present, among them Captain Langley, British Navy; Major Lottia, French Navy; Major Carrée, Spanish Navy; Count Nakimara, Japanese Navy. The results of each firing were taken by instruments and photography under the direction of Commodore Folger and a corps of naval experts; the firings were under Lieutenant De Shields. The following is a semi-official summary of the labors of the day:

The plates were set in position against stanch wooden backings, and were labeled to indicate their characters as follows: At the right was a plate labeled "High-carbon nickel steel, Carnegie, Phipps & Co." In the center was a plate marked "Low-carbon nickel steel, Harveyized, Carnegie, Phipps & Co." The third plate, on the left, was marked "High-carbon nickel steel, Harveyized, Bethlehem." The proportion of carbon in the plates was 40, 25 and 35 per cent., in the order named. In the trial of October 31 two Bethlehem plates and one Pittsburgh plate were tested. This time it was one Bethlehem plate and two Pittsburgh plates.

The firing began at 9 and was over before 12.30. As before, one Holtzer shell was fired from the 6 inch gun at the upper left-hand corner of each plate, beginning with the high-carbon Carnegie nickel steel at the right. Three other shells were fired in succession at the upper right-hand corner, the lower left-hand corner and the lower right-hand corner. Then the 6-inch gun was removed by many ox teams and negroes and the 8 inch gun put in its place. From this gun three shells were hurled against the centers of the plates. Carpenter projectiles were used to test the Carnegie high-carbon and the Carnegie low-carbon Harveyized. The Bethlehem plate was tested with a Firmity projectile. Each of the 8-inch shells weighed about 212 pounds, with charges so reduced as to subject the plate to a trial equal to that by a full-charged gun at a distance of 1500 yards. The performance of each plate is stated as follows:

#### THE CARNEGIE HIGH CARBON NICKEL STEEL.

The shots made effects as follows: Carnegie high-carbon nickel steel: First shot, 6-inch gun, fired at upper left-hand corner. Penetration, 12½ inches. Projectile re-

bounded uninjured. Small radial cracks in the circular bur around the hole. The wood backing could be seen through the shot hole. Projectile, a 6-inch Holtzer armor-piercing. Charge, 42½ pounds Dupont brown powder. Striking velocity, 2075 foot seconds.

Second shot, fired at upper right-hand corner. Penetration, 10¼ inches. Projectile rebounded broken. Short radial cracks in the bur. Projectile, charge and velocity same as before.

Third shot, fired at lower left-hand corner. Penetration, 12 inches. Projectile rebounded, leaving wood backing exposed to view. A vertical crack was developed from the point of impact to the bottom of the plate. Projectile, charge and velocity same as before.

Fourth shot, fired at lower right-hand corner. Penetration, 11¼ inches. Projectile rebounded intact. A horizontal crack extended through the lower left-hand shot hole to the left edge of the plate. Projectile, charge and velocity same as before.

Fifth shot, fired at center. Penetration, 9¼ inches. Projectile rebounded, badly upset. Cracks connected the center hole with the upper right-hand hole and the lower left-hand hole, and continued to the edge of the plate. Projectile, 8-inch Carpenter; weight, 250 pounds; charge, 72½ pounds. Striking velocity, 1700 foot seconds.

#### THE BETHLEHEM HIGH-CARBON NICKEL STEEL PLATE, HARVEYZIZED.

Plate No. 3, high-carbon nickel steel, Harveyized, from the Bethlehem works. From the 6-inch gun: First shot, fired at upper left-hand corner. Penetration, 12 inches. Projectile rebounded, much broken. No cracks. Projectile, charge and velocity same as before.

Second shot, plate high-carbon nickel steel, Bethlehem, fired at upper right-hand corner. Penetration, 5 inches. Projectile broken to small fragments and widely scattered, the point much flattened, remaining in the hole. No cracking. Projectile, charge and velocity same as before.

Third shot, fired at the lower left-hand corner. Penetration, 12½ inches. Projectile rebounded intact. Eight fine cracks radiating from the hole from 1 to 3 inches in length. Projectile, charge and velocity same as before.

Fourth shot, fired at lower right-hand corner. Penetration, 5½ inches. Projectile broken into fragments, its point remaining imbedded in the face of the plate. Projectile, charge and velocity same as before.

Fifth shot, fired at center. Penetration, 12¼ inches. Projectile rebounded, slightly chipped. Plate cracked from center through upper and lower left-hand holes to the edges of the plate. Projectile, Firmity; weight, 210 pounds. Charge, 74½ pounds of powder. Striking velocity, 1750 foot seconds.

When the firing was finished the Carnegie high-carbon plate showed more cracks and more clearly defined than either of the others. The Carnegie low-carbon Harveyized revealed the least conspicuous fractures. The Bethlehem high-carbon plate was cracked, the fracture being confined, as in the Carnegie low-carbon plates, principally to the left of the center. In the Carnegie low-carbon Harveyized and the Bethlehem plates the fractures did not become strongly apparent until after the attack by the 8-inch gun, which greatly increased all prior injuries.

#### CARNEGIE LOW-CARBON NICKEL STEEL, HARVEYZIZED.

Plate No. 2, low-carbon nickel steel, Harveyized, Carnegie—From 6-inch gun: First shot, fired at upper left-hand cor-

ner. Penetration, 14½ inches. Projectile remained in plate, apparently intact. Short radial cracks in burr. Projectile, charge and velocity same as before.

Second shot, fired at upper right-hand corner. Penetration, 14½ inches. Projectile remained in the plate, apparently intact. Projectile, charge and velocity same as before.

Third shot, fired at lower left-hand corner. Penetration, 9½ inches. Projectile rebounded, shortened 2 inches. Projectile, charge and velocity same as before.

Fourth shot, fired at lower right-hand corner. Penetration, 20½ inches. Projectile remained intact in the hole. Projectile, charge and velocity same as before.

From 8-inch gun: Fifth shot, fired at center. Penetration, 15½ inches. Projectile rebounded, broken in many pieces. Plate cracked from center to upper right and left hand holes and lower left-hand hole, and from the upper left-hand and lower left-hand holes to the edges of the plate. Projectile, charge and velocity same as other 8-inch shot.

Of the 15 shots fired, therefore, 10 were successfully resisted by the plates and repelled in more or less damaged condition after penetration, three remained imbedded and two were totally destroyed with little or no penetration. This result, even with the cracks that were developed, marks a great advance in the manufacture of armor, and especially proves the value of nickel used in combination with steel.

#### COMMODORE FOLGER'S VIEWS.

Commodore Folger summed up the results in the following words:

"The Harvey high-carbon steel plate from Bethlehem has shown the least penetration and least cracking of all the six, and is decidedly the most successful. The penetration was markedly less and the cracking one-third less than the other Harvey nickel steel plate. In no case did the point of the projectile go into the backing, and the plate cracked along the weaker side. It is but fair to suppose that if the left-hand side had been tempered like the right-hand side no crack would have occurred. The Carnegie high-carbon nickel steel plate contained 45 per cent. of carbon, which we knew before we fired a shot was too high, and we thought it would probably crack. The tempering methods used in the low-carbon nickel Harvey plate were very defective, and I did not expect from it better results than from the un-Harveyized nickel steel plate which Carnegie furnished before. The high-carbon nickel steel plate Harveyized is unquestionably superior to any armor that has ever been tested either in this country or abroad."

#### SECRETARY TRACY'S CONCLUSIONS.

In a conversation with the correspondent of *The Iron Age* Secretary Tracy said that he was satisfied with the tests so far as 6-inch projectiles were concerned. "The plates are proof against them," he said. "We will now try something heavier."

It is not improbable that the closing series will be confined to firing three 8 inch projectiles at each plate, the shot striking the plates at each of the three points of an equilateral triangle.

The tests of Saturday are regarded as the most important. The official photographic views will not be completed until the whole series is completed.

The plates used cost \$5000 each.

It was the unanimous opinion that the high-carbon nickel steel Harveyized plate of the Bethlehem Iron Company won the honor of the day by a large majority.

The Buffalo Smelting Works have ordered a Jenkins & Lingle hammer through L. & R. Wister & Co. of Philadelphia, the sales agents.

#### Proposed New French Tariff.

The following are the proposed import duties (per 100 kg.) on metals, minerals, oils, &c., as approved by the French Chamber of Deputies. The measure awaits ratification by the Senate, but no material alterations are likely to be made in it. (The first column of figures shows the maximum and the second the minimum rate).

	f. c.	f. c.
	200 0	150 0
Aluminum .....	Free.	Free.
Iron: .....	Free.	Free.
Ore: .....	Free.	Free.
Foundry pig and refining pig containing less than 25 per cent. of manganese .....	2 0	1 50
Ferro-manganese containing more than 25 per cent. of manganese; ferro-silicium containing more than 5 per cent. of silica; silico-spiegel containing at least 30 per cent. of silica and manganese; ferro-chrome containing 10 per cent chrome or more; ferro-aluminum containing 10 per cent. of aluminum or less .....	4 75	3 50
Ferro-aluminum containing more than 10 per cent and less than 20 per cent of aluminum .....	9 0	7 50
Crude in blocks, prisms or bars containing 4 per cent. of slag or more .....	5 0	4 50
Less than 4 per cent. ....	6 0	5 0
Rolled in bars, angle iron, T iron; also axles and tires rough from the forge .....	6 0	5 0
Iron or steel, machined. ....	7 50	6 50
Hoops in iron or steel exceeding 1 mm. thick .....	7 50	6 50
Hoops in iron or steel of 1 mm. or less .....	8 0	7 0
Flat sheets rolled or hammered exceeding 1 mm. thick, not shaped .....	7 50	7 0
Flat sheets rolled or hammered exceeding 1 mm. thick, shaped in any way .....	8 0	7 50
Thin sheets and black sheets flat, more than 6-10 mm. and not exceeding 1 mm. thick, not shaped .....	10 0	9 0
Thin sheets and black sheets, flat, more than 6-10 mm. and not exceeding 1 mm. thick, shaped in any way .....	11 0	10 0
Thin sheets and black sheets flat, 6-10 mm. thick or less, not shaped .....	11 0	10 0
Thin sheets and black sheets flat, 6-10 mm. thick or less, shaped .....	12 0	11 0
Sheets coated with tin, copper, lead or zinc, more than 6-10 mm. thick .....	14 0	12 0
Sheets coated with tin, copper, lead or zinc, 6-10 mm. thick or less .....	15 0	13 0
Wire of iron or steel coated or not coated with tin, copper, zinc or spelter, more than 2 mm. diameter .....	8 0	7 0
Wire of iron or steel coated or not coated with tin, copper, zinc or spelter more than 1 mm. and not exceeding 2 mm. diameter .....	11 0	10 0
Wire of iron or steel coated or not coated with tin, copper, zinc or spelter from 5-10 mm. to 1 mm. diameter .....	13 0	12 0
Wire of iron or steel coated or not coated with tin, copper, zinc or spelter, less than 5-10 mm. diameter .....	22 0	20 0
Forge scale .....	30 0	17 0
Steel: *		
Rails of iron or steel .....	7 0	6 0
Ingots .....	6 0	5 0
Blooms or billets .....	7 0	6 0
Other sorts of any kind .....	7 0	6 0
Axles and tires of wheels rough from the forge .....	10 0	8 0
Fine steel for tools .....	20 0	15 0
In hoops or sheets brown, hot rolled, more than 1 mm. thick, not shaped .....	7 50	7 0
In hoops or sheets brown, hot rolled, more than 1 mm. thick, shaped .....	9 50	9 0
In hoops or sheets brown, hot rolled, more than 6-10 mm. and up to 1 mm. thick, not shaped .....	8 0	7 50
In hoops or sheets brown, hot rolled, more than 6-10 mm. and up to 1 mm. thick, shaped .....	10 0	9 50
In hoops or sheets brown, hot rolled, of 6-10 mm or less, shaped .....	11 0	10 0
In hoops or sheets brown, hot rolled, of 6-10 mm or less, not shaped .....	12 0	11 0
In hoops or sheets brown, white, cold rolled, of any thickness, not shaped .....	19 0	15 0
In hoops or sheets brown, white, cold rolled, of any thickness, shaped .....	20 0	16 15

\* The duties here shown apply only to steel capable of being tempered. Other kinds of steel are subject to the same duties as iron.

In wire form as strings of musical instruments .....	40 0	30 0
Filings and forge scale .....	free	free
Scrap from pig iron .....	2 0	1 50
Scrap from manufactured iron or steel .....	1 0	0 75
Slag and forge scoria .....	free	free
Copper: .....		
Ore .....	free	free
Pure or alloyed with zinc or tin of first fusion, and in bars, pigs or plates .....	free	free
Pure or alloyed with zinc or tin of first fusion, rolled or hammered in bars or slabs .....	13 0	10 0
Pure or alloyed with zinc or tin of first fusion, in wire of any gauge, polished or not, except gilded or silvered .....	13 0	10 0
Aluminum bronze, crude, not containing more than 20 per cent. of aluminum .....	13 0	10 0
Gilded or silvered in blocks or ingots beaten, drawn, rolled or spun on to wire or silk .....	130 0	100 0
Filings and cuttings old work .....	free	free
Lead: .....		
Ore and scoria of all sorts .....	free	free
In crude blocks, pigs, bars, or sheets, argentiferous .....	free	free
In crude blocks, pigs, bars, or sheets, non-argentiferous, imported from other countries where argentiferous lead is exempted from export duty .....	free	free
In crude blocks, pigs, bars, or sheet, non-argentiferous, coming from other countries .....	2 0	free
Alloyed with antimony, in blocks .....	3 0	3 0
Beaten or rolled .....	3 0	3 0
Filings and cuttings of old work .....	free	free
Tin: .....		
Ore .....	free	free
In crude blocks, pigs, bars or sheets .....	free	free
Alloyed with antimony (Britannia metal) in ingots .....	5 0	5 0
Pure or alloyed, hammered or rolled .....	6 0	6 0
Filings and cuttings of old work .....	free	free
Zinc: .....		
Ore .....	free	free
In crude blocks, pigs, bars or sheets .....	free	free
Rolled .....	4 0	4 0
Filings and cuttings .....	free	free
Nickel: .....		
Ore .....	free	free
Products of first fusion (pig, matte, regulus) .....	free	free
Refined, in ingots or crude blocks .....	free	free
Pure, hammered, rolled or drawn .....	13 0	10 0
Alloyed with copper, with or without zinc, in ingots or crude blocks .....	10 0	7 50
Alloyed with copper, with or without zinc, hammered, rolled or drawn .....	23 0	17 50
Mercury, native .....	free	free
Antimony: .....		
Ore .....	free	free
Sulphurated .....	free	free
Metallic or regulus .....	6 0	6 0
Arsenic .....	free	free
Cadmium, crude .....	free	free
Bismuth .....	free	free
Manganese ore .....	free	free
Cobalt ore .....	free	free
Ores not otherwise mentioned .....	free	free
Machinery: .....		
Fixed steam engines and marine engines separate from their boilers; steam pumps; engines driven by gas, petroleum, hot air or compressed air, weighing more than 250 kg. ....	18 0	12 0
Fixed steam engines and marine engines separate from their boilers; steam pumps; engines driven by gas, petroleum, hot air or compressed air, weighing 250 kg. or less .....	30 0	20 0
Semi-fixed steam engines and portable engines attached to their boilers .....	17 0	20 0
Locomotives for railways and roads .....	20 0	15 0
Hydraulic machinery operating wheels, pistons, or turbines, pumps and ventilators, weighing 250 kg. and over .....	15 0	10 0
Hydraulic machinery operating wheels, pistons, or turbines, pumps and ventilators, weighing less than 250 kg. ....	25 0	15 0
Locomotive tenders .....	15 0	10 0
Card setting machines .....	15 0	10 0
Carding machines, without furniture .....	18 0	12 0
Machines to clean, work and prepare flax, wool, cotton and other textile material .....	18 0	12 0
Looms, continuous and complete, for spinning and twining .....	18 0	12 0
Weavers' looms .....	12 0	8 0
Stocking and hosiery frames .....	40 0	27 0
Tulle, lace, and guipure frames .....	10 0	5 0
Paper making machines .....	15 0	9 0
Printing machines .....	8 0	6 0
Agricultural machinery (except motors) .....	15 0	9 0
Sewing machine frames and driving gear .....	10 0	8 0
Sewing machine working parts .....	50 0	35 0

Dynamo-electric machinery:		
Of 1000 kg. and more .....	30 0	20 0
From 50 to 1000 kg. ....	45 0	30 0
From 10 and up to 50 kg. ....	100 0	80 0
Machine tools:		
Heavy, weighing more than 1000 kg. ....	15 0	10 0
Medium, weighing from 250 to 1000 kg. ....	20 0	16 0
Small and of precision, weighing less than 250 kg. ....	70 0	50 0
Machinery of a general character:		
Transmitters, scales, weighing machines, fixed railway material, signals, presses, hoisting appliances, apparatus not particularized actuated by mechanical motors. ....	15 0	10 0
Boilers:		
Steam boilers* in iron or steel, simple or fitted with cross tubes, feed-water heaters and internal fire boxes. ....	12 0	9 0
Steam boilers* in iron or steel, tubular or semi-tubular—viz., composed of tubes in iron, steel, copper or brass. ....	18 0	14 0
Parts of multitubular boilers, composed in preponderating proportions of iron or steel tubes, fitted together or not. ....	24 0	18 0
Open boilers, gas holders, receivers, stoves and heating apparatus, in cast or wrought iron and steel. ....	12 0	8 0
Sugar plant and heating appliances for breweries, distilleries, perfumers, pharmacists and cooks, in which the copper or bronze dominate in weight; if weighing 250 kg. and more. ....	30 0	20 0
Sugar plant and heating appliances for breweries, distilleries, perfumers, pharmacists and cooks, in which the copper or bronze dominate in weight; if weighing less than 250 kg. ....	50 0	40 0
Refrigerating apparatus, weighing more than 250 kg. ....	20 0	15 0
Refrigerating apparatus, weighing 250 kg. and less. ....	30 0	25 0
Detached parts:		
Card sheets and fillet cards in leather fitted with iron or steel spikes of at least 1 mm. diameter at the base. ....	70 0	50 0
Card sheets and fillet cards in iron or steel wire attached to tissues with or without caoutchouc. Card sheets and fillet cards in leather fitted with iron or steel spikes less than 1 mm. diameter at the base. ....	200 0	150 0
Weavers' reeds and reed teeth in iron or copper. ....	45 0	30 0

(To be continued.)

C. F. Howe, lately of Ishpeming, is quoted as authority for the following statement: "Large deposits of a high grade of Bessemer ore have been found on the Mesaba, and have been sufficiently tested to prove that the range can equal or probably exceed the famous Gogebic Range of Michigan and Wisconsin. The ore-bearing range runs across the north central part of Itasca and St. Louis (Duluth's) counties, and this fall numerous explorers and companies are located along it, engaged in exploration and opening and developing the properties. A railway from Duluth, to be about 75 miles long, has been surveyed, and the right of way is now being cleared. Next August it is believed ore will be shipped from the mines first discovered. The ore is generally a soft, hematite Bessemer that can be handled in the mine by steam shovels or man power, and almost entirely without blasting or other expensive labor. It is similar in character to the famed Gogebic ores, which, first shipped in 1883, produced in 1890 2,500,000 tons."

The Grand Rapids Improvement Company were organized at Grand Rapids, Mich., on the 12th inst. They include in their membership nearly all the wealthy men of the city. The organization will be incorporated as a stock company, the plan being to offer free sites to large manufacturing and to build and equip with power immense factory buildings and rent apartments in them to small manufacturers.

\* Fittings and apparatus necessary to the safe working of boilers are included in the above duties. Furnace bars are taxed separately at the rate of 4 fr. per 100 kg.

## MANUFACTURING.

## Iron and Steel.

The Vulcan Iron Company, Limited, of New Castle, Pa., have contracted for a new brick machine shop, 100 x 50 feet in size. The new shop will be equipped with entirely new machinery, including a traveling crane and a new high-speed engine.

The sale to the creditors of the rolling mill plant of Brown, Bonnell & Co., at Youngstown, Ohio, has been confirmed by the Supreme Court at Washington. It is said that a reorganization will take place and the works be taken out of the hands of Receiver Fayette Brown, who has so successfully managed them since the failure of the company formerly operating them.

The George M. Rice Steel and Iron Company, Worcester, Mass., who will succeed the bankrupt Worcester Steel Works, have elected the following board of directors: George M. Rice of Worcester, Conrad N. Jordan of New York, Ransom C. Taylor of Worcester, Elijah B. Stoddard of Worcester, Charles J. Rawson of Oxford, Daniel W. Darling of Worcester and Edwin Gleason of Worcester. The directors organized by electing the following officers: President, George M. Rice; treasurer, Edwin Gleason; secretary, J. P. McCafferty; manager, William Colles of Thurlow, Pa.

In referring recently to No. 2 stack of the Carrie Furnace Company, Rankin P. O., Pa., we stated that the work of relining the furnace and making the repairs was executed by McClure & Amsler of Pittsburgh. We are advised that McClure & Amsler merely furnished the necessary bricklayers, and that the work of relining and making repairs was carried out under the direction of the furnace superintendent.

The Bessemer Rolling Mills, at Birmingham, Ala., have been sold, under a decree in Chancery, to Morris Adler and William Terney of Birmingham and J. N. Carpenter of Natchez, Miss., for \$100,000. It is stated that the works will be enlarged and put into operation at an early date.

The long strike at the Niedringhaus Rolling Mills, St. Louis, Mo., has been settled by compromise and the men have returned to work.

The Jenifer Iron Company, at Jenifer, Ala., have been perfecting plans for a cotton-tie factory which they contemplate erecting at that place.

The Blairsville Rolling Mill and Tin Plate Company of Blairsville, Indiana County, Pa., have been granted a charter, with a capital of \$75,000. The following are the directors of the concern: J. H. Devers, J. M. Harvey, Paul Graff, Jacob Graff, T. D. Cunningham, R. W. Wehrel and D. M. Fair, all of Blairsville. The above concern proposes to erect a complete tin plate plant at Blairsville, Pa., on the line of the West Penn. Railroad, 55 miles from Pittsburgh. With this object in view, they have let a contract to the Leechburg Foundry and Machine Company for two complete 20 x 26 inch hot mills and two 18 x 24 inch cold mills, also two 36-inch doubling shears and one 36-inch trimming shear. The firm will roll down their sheets from the bar, and will make tin andterne plates. The contract for the machinery calls for its completion not later than March 1, 1892, and the plant is expected to be in operation turning out tin andterne plates not later than April 1, 1892. The firm will start out with a capacity of 250 boxes per day, but expect to increase this capacity in a short time after commencing operations. The buildings will be constructed so that they can be enlarged at any time. The Leechburg Foundry and Machine Company have recently received a contract for the erection of two sheet furnaces to be built for the Etna Iron and Steel Company, Bridgeport, Ohio.

It is expected that the new buildings in course of erection by the United States Iron and Tin Plate Mfg. Company, at Demmler, Pa., will be under roof during December, and the machinery put in place in January next. These improvements and additions are expected to give the new plant a capacity for turning out 250,000 boxes of tin andterne plates per year. The works at present comprise two sheet mills for merchant sheet and three tin-plate mills, on which mostly light sheet iron, taggers iron, pickled and cold rolled sheets will be made. The additions to the works consists of a new mill building 175 feet square, a new tin house 50 x 100, with 12 tinning stacks, a 600 horse-power engine, to which will be attached four new tin-plate mills and cold-rolled mill and other necessary machinery. W. C. Cronmeyer, president of the above concern, advises us that he expects the entire new plant will be completed and in operation not later than February 1, 1892.

At Pittsburgh last week the entire interests of the Cameron Iron and Coal Company, at Emporium, Pa., consisting of blast furnace, nearly 7000 acres of coal and Pittsburgh land in Cameron County, buildings and machinery, was sold to an Eastern syndicate.

Last week a successful effort was made by Charles M. Schwab, general superintendent of the Edgar Thomson Steel Works of Carnegie Bros. & Co., Limited, at Bessemer, Pa., to eclipse all previous records for production. For the 24 hours ending on Friday morning, the 13th inst., at 6 o'clock there was produced in the above plant 1907 gross tons of finished rails, No. 1 turn making 3022 rails, equal to 932 tons, and No. 2 turn making 3173 rails, equal to 975. During the same period the converting department turned out 2070 tons of ingots. General Superintendent Schwab feels much gratified at his success in beating all previous records for rail production, and during the time that the test was in progress remained constantly at the works carefully looking out for weak places and inferior machinery. Aside from some improvements already under way in the converting department of the Edgar Thomson Steel Works few changes will be made during the annual shut down, which occurs during the Christmas holidays.

The temporary embarrassment of James P. Witherow, engineer and contractor, of Pittsburgh, whose large works are located in New Castle, Pa., has already been noted in these columns. As has been stated, a receiver has been appointed for Mr. Witherow in the person of A. W. Thompson, secretary of the Etna Iron Works, Limited, at New Castle, Pa., and a gentleman who is fully competent to discharge the duties which will devolve upon him. An inventory of the assets and liabilities of the firm is now being taken and will be completed as soon as possible. At the time the receiver was appointed the men in the employ of Mr. Witherow had not been paid for four weeks. However, arrangements were made by which sufficient money was secured to pay the men for two weeks, and the balance due them will probably be paid during the present week. It is also expected that the works of Mr. Witherow will be put in operation in a very short time. The statement of liabilities and assets, which will be made to the creditors, is expected to be very favorable, and it is claimed will show \$3 of assets to \$1 of liabilities. The only reason assigned for the temporary suspension of Mr. Witherow was inability to make collections, he having a great deal of money tied up among Southern furnace operators. During November a decision is expected from the Supreme Court in favor of Mr. Witherow, which, if made, will result in \$80,000 being paid to Mr. Witherow, which has been tied up in the courts several years.

Last week the necessary excavating was commenced for the foundations of the new Bessemer steel plant to be erected by the Shenango Valley Steel Company at New Castle, Pa. As already stated in these columns, the plant will be erected by the Pittsburgh Iron and Steel Engineering Company of Pittsburgh.

A suit of more than ordinary interest was on trial in the United States Circuit Court at Pittsburgh last week. The plaintiffs are John T. Haskin, John H. Dalzell, W. J. Crawford and Francis T. Bates, the latter of Philadelphia. The defendants are Dilworth, Porter & Co., Limited. The suit is for damages for the alleged unlawful use of a patent rolling mill. Haskin invented an open housing for a rolling mill while in the employ of Dilworth, Porter & Co., and when he refused to assign the patent to them they dismissed him from their service. Defendants held that when they employed Haskin they also employed all his inventive ability, and that in consequence they rightfully own the patent. This Haskin denies, and the court must settle the controversy, which involves about \$20,000.

An interesting experiment was tried on the 9th inst. at the Milwaukee works of the Illinois Steel Company. The attempt was made to roll thin steel sheets on the nail-plate train, which has been standing idle for several years. Some 500 pounds of No. 30 sheets were turned out, which proved to be smooth, even and of very good quality. They were taken to Chicago to be tinned. The officers of the company are reticent regarding their intentions, but the expectation is entertained that the success of the experiment may lead to the manufacture of tin plate at this plant. The rolls are narrower than the usual tin-plate rolls, but they can be widened without much difficulty.

Because the puddlers refused to make six heats a day, instead of five, as at present, the entire plant of the Oxford Iron and Nail Company, at Oxford, N. J., has shut down.

The Chicago Malleable Iron Company have filed a certificate decreasing their capital stock from \$400,000 to \$300,000.

The Jackson Iron Company of Cleveland, Ohio, have abandoned their coal furnaces at

Fayette, Mich., and disposed of the material and machinery.

Bovaird & Seyfang of Pittsburgh, manufacturers of oil well supplies, who have works in that city and also in Bradford, Pa., have been granted a charter of incorporation under the style of the Bovaird & Seyfang Mfg. Company, with a capital stock of \$500,000.

The strike which was in progress last week at the American Iron and Steel Works of Jones & Laughlins, Limited, at Pittsburgh, and mention of which was made in our issue of last week, has been settled, and the entire plant is now in full operation. The men have gone to work at the terms proposed by the firm.

The Linden Steel Company of Pittsburgh have given a contract to a constructing firm in that city for the erection of a 25-ton open-hearth steel furnace with Siemens gas producers to supply fuel for the same.

At the annual meeting of the stockholders of the Norristown Steel Company, Norristown, Pa., the following directors were elected: S. D. Hawley, Philadelphia; H. H. Haines, Rising Sun, Md.; C. C. Higley, Malvern; E. D. Daniels, George J. Humbert and Addison R. Wright of Norristown; Joseph H. Hampton of Bridgeport; William McDaniel, Philadelphia; M. B. Pratt and I. N. Haines, West Chester, and D. M. Taylor, Oxford. Following the stockholders' meeting the directors organized by electing S. D. Hawley, president; J. Clinton Sellers, secretary, and Charles C. Higley of Malvern, treasurer.

The plant of the Radford Pipe and Foundry Company, Radford, Va., is about completed and will be put in operation by December 1. The company have a large number of orders already on their books and will start with a full force.

The Pulaski Development Company, Pulaski, Va., are pushing the work on their furnace. They expect to put it in operation January 1. It will have a daily capacity of 150 tons. Work on the Pulaski Rolling Mill will be resumed at an early day.

The blowing engines for the Gracey-Woodward Iron Furnace, at Clarksville, Tenn., have been received.

The Knoxville Furnace and Mining Company, Knoxville, Tenn., have been organized by Col. R. T. Walshe of New Orleans, Col. E. Eastman of Birmingham, together with Knoxville capitalists, and will erect a 100-ton iron furnace.

The Texas Iron Rolling Mills, Fort Worth, Texas, have filed an amendment to their charter, authorizing the removal of their headquarters to Tyler.

The Baker Iron Company, Jasper, Tenn., are contemplating the purchase of a full outfit of machinery for the manufacture of bar iron and steel.

The Napier Iron Works, Napier, Tenn., have about completed their furnace and will go into blast about January 1. They will make charcoal iron from brown hematite ore.

The Coosa Furnace, at Coosa, Ala., which has been idle all the summer, on account of the low price of iron, will probably resume operations this month.

The United States Rolling Stock Company, Anniston, Ala., are enjoying a very satisfactory trade. They now have enough orders booked to keep their foundries running until the middle of February. The company expect to be able to take their business out of the hands of the receiver during the present month.

The Cincinnati Corrugating Company have broken ground at Piqua, Ohio, for an addition to their tin plate plant, and orders have been placed for the following additions to its present outfit: One pair of cold rolls from A. Garrison & Co. of Pittsburgh, six annealing boxes from the McKeesport (Pa.) Machine Company, four Morewood tinning pots, one five-roll Morewood tinning machine, one pump for liquid tin, complete kits of tinner's and washman's tools, the necessary shafting and pulleys and fire and red brick, cement, lime, castings, bolts, &c., necessary to erect a complete tinning stack. It is expected to have the addition in running order in six weeks, when the company will have greatly increased facilities for making bright andterne tin plates of the highest grades.

The Eagle Iron and Steel Company, a new corporation, have bought from the New York and Ohio Iron and Steel Company the old Ironton Rolling Mill, Ironton, Ohio, and, under the management of Lewis Jones, are now engaged in rebuilding and remodeling the mill in accordance with modern ideas. Among other changes a new three-high bar mill will be put in to replace the old one, the guide mill will be rebuilt and a new sheet mill will be added. They have also contracted with Alex Laughlin & Co., engineers and contractors, Lewis Block, Pittsburgh, Pa., for a complete gas heating plant, including the furnaces, gas pro-

ducers and several hundred feet of underground flue. Alex Laughlin & Co. have contracted to have this work completed and ready for operation by the last week in January next, about which date the mill will probably be started up. The Eagle Iron and Steel Company have also let a contract to the Lloyd Booth Company of Youngstown, Ohio, for the erection of a 16-inch three-high bar mill and a 20-inch sheet mill.

#### Machinery.

The Lincoln Iron Works, Rutland, Vt., are making additions to their property preparatory to increasing their business.

The Porter Machine Company of Newark, N. J., are erecting an addition to their works 103 x 65 feet in size and three stories in height.

The storeroom and warehouse of the J. H. McLain Machine Works, at Canton, Ohio, have been destroyed by fire at a loss of \$40,000.

A foundry and machine shop will be erected at Flatonia, Texas, by E. P. Hanland.

W. H. Francks and S. F. Raspberry will erect a foundry and machine shop at Newberne, N. C.

The Courtwright Mfg. Company, makers of railroad supplies, will remove their factory from Detroit to Benton Harbor, Mich.

The Walton Architectural Iron Works of Cincinnati, Ohio, have assigned. The assets are \$90,000 and the liabilities thought to be about the same.

It is stated that a change of management will take place at the Providence, R. I., works of the Corliss Steam Engine Company. The present company is composed of the widow of the late George C. Corliss and her daughter and son. The works at present employ 400 hands five days in a week, where formerly 800 were kept on full time.

The Roanoke Machine Works, Roanoke, Va., are running full in all departments, their pay roll for October being a little over \$40,000, and the indications are that it will exceed \$50,000 for November.

It is stated the Abendroth & Fisher Company of Birmingham, Ala., will build an iron foundry at Attalla.

The recently incorporated Maryland Bolt and Nut Company have erected a plant at Curtis Bay, near Baltimore, Md., the main structure being 336 by 70 feet. Operations will commence at once, with an estimated daily output of 100,000 bolts.

The Goubert Mfg. Company, 32 Cortlandt street, New York City, are doing a very large business in their well known Goubert feed-water heater. They report the following among their sales for the month of October: The Edison Electric Illuminating Company of New York, one 400 horse-power, one 600 horse-power and one 2000 horse-power; J. B. Ford & Co., Wyandotte, Mich., 1000 horse-power; Hathaway Mfg. Company, New Bedford, Mass., 1200 horse-power; Ottumwa Railway Electric and Steam Company, Ottumwa, Iowa, 350 horse-power; the De La Vergne Refrigerating Machine Company, New York City, 2250 horse-power; Lonsdale Company, Lonsdale, R. I., 1000 horse-power; Wamsutta Mills, New Bedford, Mass., 1600 horse-power; Detroit Electric Light and Power Company, Detroit, Mich., 1000 horse-power, besides a number of smaller heaters.

The C. H. Woodruff Company will operate a foundry at Elgin, with a capital stock of \$60,000. Incorporators, Charles H. Woodruff, Julius Clarke Daniels and W. E. Bosworth.

Announcement is made that the Reorganization Committee that have had charge of the affairs of the Westinghouse Electric and Mfg. Company of Pittsburgh have made an entire success of their undertaking. During the latter part of last week the firm commenced to lift all paper of the company held by the different banks in Pittsburgh. Lemuel Bannister, general manager of the company, stated that it is impossible to name the exact date when all the indebtedness of the Westinghouse Electric and Mfg. Company will be paid off, but it will be done as rapidly as possible. It is understood that the firm have a considerable number of orders on hand for the construction of electrical machinery, and their large works in Pittsburgh are being operated full time.

Referring to the basic brick machine, invented by Henry Aiken, mechanical engineer, of Pittsburgh, an illustration of which appeared in *The Iron Age* of November 5, we may state that these machines are being built by Wm. Tod & Co. of Youngstown, Ohio. Two of them are in successful operation at the Homestead Steel Works of Carnegie, Phipps & Co., Limited, at Homestead, Pa.

#### Hardware.

The Ottumwa Cutlery Works, Ottumwa, Iowa, have greatly increased their facilities

for the production of cutlery. Heretofore they have employed 100 hands, but the enlargement of the works and the addition of machinery have increased their working force to 500.

The Wheeling Lamp and Stamping Company, Nail City Lantern Company and the Eagle Glass Company, Wheeling, W. Va., have consolidated under the name of the Nail City Stamping Company, the paid-up capital of which is \$300,000. The company will manufacture lanterns, stamped goods, glass and glassware. Their officers are: A. W. Paull, president; F. M. Strong, secretary, and James Paull, treasurer. The directors are J. N. Vance, A. W. Paull, J. D. Culbertson, Geo. W. Woods and John J. Jones.

Reports have been current to the effect that A. J. Jordan, Sheffield, England, and St. Louis, Mo., is about discontinuing the manufacture of his goods in England. This, however, we are advised is incorrect, the fact being that he is materially curtailing his production in pocket cutlery, because under the operation of the existing tariff it is found that many patterns which were formerly made in England can no longer be brought to this country and sold at a profit. The more expensive knives, however, are still made there. This also applies to fine razors, for the production of which Mr. Jordan has increased his facilities during the present year.

The organization in England of the British Screw Company, Limited, with a capital of £100,000, in £10 shares, is announced, to carry on the business, in all its branches, of a manufacturer of and dealer in screws, nails, bolts, nuts, &c.; as wire drawers and workers of metals of all descriptions; iron, steel and brass founders, colliery proprietors, engineers and machinists, &c. The first subscribers, who take one share each, are: E. G. Angell, Providence, R. I.; C. Thurston, Providence, R. I.; O. Arnold, Providence, R. I.; C. L. Rogers, Leeds; F. G. Longee, Leeds; L. Thomas, Rumford Place, Liverpool; H. A. Stirling, Rumford Place, Liverpool.

The Stuart & Peterson Company, Philadelphia, Pa., are making a specialty of druggists' and chemists' goods, as shown on a large illustrated circular. Among other goods shown are Acme Evaporating Dishes, with detachable handles; vanilla bean boilers, mortars and pestles, counter scales, &c. The claim is made that the enamel on these goods is especially adapted for chemical uses, and it is warranted acid proof. They also manufacture a full line of enameled hollow ware.

The Allentown Hardware Company of Allentown, Pa., have recently been reorganized, with a capital of \$90,000, and are preparing to turn out a very superior line of builders' hardware. The works are well located, and with every facility for handling a large business. They are likely under the new management to become an important factor in their line of business. During a recent visit to the works by the Philadelphia representative of *The Iron Age* some very handsome work was exhibited, including plain bronze, deoxidized bronze, plain silver, deoxidized silver, besides the usual line of japanned goods. The company are making a specialty of refrigerator locks, door locks, &c., and have several designs of unusual beauty, which will doubtless be placed before the trade at an early date. One entirely new thing is a door knob, which acts either by a turn or a pull, as may be most convenient. A concealed spiral spring withdraws the bolt by a pull, on the knob just as easily as it can be opened by a turn. This is said to be an entirely new device, and will doubtless attract wide attention.

#### Miscellaneous.

A company has been organized at Birmingham, Ala., by Isaac P. Gilbert of Michigan, with a capital of \$1,750,000, to be known as the Mammoth Mfg. Company, for the manufacture of agricultural implements.

The Swift Powder and Cartridge Company, capital \$500,000, have been incorporated at Covington, Ky., for the manufacture of guns, cannons, powder, &c.

The Continental Iron Works, Brooklyn, N. Y., sole manufacturers in the United States of corrugated flues for boiler furnaces, are kept very busy supplying the steadily increasing demand for their celebrated specialty. It is of interest to note in this connection that the Board of Supervising Inspectors of Steam Vessels, at their special meeting at Washington, September 28, raised the constant for corrugated furnaces from 12,500 to 14,000, which allows an increase of steam pressure on boilers using corrugated furnaces of 12 per cent. over the old formula.

The factory of the Acme Railway Signal and Mfg. Company, at Galesburg, Ill., has been burned to the ground. The loss is \$25,000, covered with \$20,000 insurance.

The Dominion Barb Wire Works Company of Montreal will establish a branch factory at Winnipeg, Man.

Ground has been broken at Elwood, Ind., for the new works of the American Tin Plate Company, incorporated in September, with a capital stock of \$300,000. Lloyd Booth & Co. of Youngstown have the contract for furnishing the tinning set complete.

The Galvin Brass and Iron Works of Detroit, Mich., will hereafter be known as the Michigan Brass and Iron Works. The capital stock has been increased from \$100,000 to \$200,000. The company will build new works, a site of 10 acres having been secured for the purpose just outside of the city limits. They will consist of a machine shop 150 x 50 feet, two stories high, to which will be attached a foundry, casting shed and engine room, making the total length of the main building 284 feet; a brass foundry, metal and core room 91 x 52 feet, and erecting and store room 240 x 50 feet, and several smaller buildings designed for blacksmith shop, tool house, pattern shop, boiler house, &c. The entire plant of buildings will be of brick, with stone trimmings, and will cost about \$55,000.

The Michigan Bolt and Nut Works of Detroit, Mich., are distributing photographs of the whaleback steamer Charles W. Wetmore, now on its way around the Horn, with a cargo from New York to Tacoma. The company have a contract with the builders of this class of vessels, the American Steel Barge Company of West Superior, Wis., for 285,000 pounds of rivets to be used in the construction of four of the McDougall whalebacks. They have also furnished a large quantity of rivets for some of the steel cruisers now building for the Government, and the naval inspectors pay a high compliment to the quality of the rivets, which are formed in solid dies, are free from pins or other irregularities of surface and are of uniform diameters.

Parlin & Orendorff Company have during the past summer been quite busy adding large improvements to their agricultural works. They have lately completed one building 100 x 60 feet, three stories high; one building 132 x 72 feet, three stories; one building 48 x 60, three stories; one building 160 x 60, one story; one building 160 x 30, one story; one building 40 x 40, one story. These buildings are all built of brick in a very thorough, substantial manner. They have also added new railroad tracks with switches, and have also put in a large Corliss engine of 530 horse-power, and over 30 new machines in the various departments. These large improvements have all been necessary by reason of the increasing demand for their line of goods. Their plant is now one of the very largest in this country, with capacity for turning out at least one plow every minute. They use annually over 5000 tons of iron and steel, 4,000,000 feet of lumber and employ over 500 men. Their goods are sold in all parts of this country. They have six branch houses of their own, situated in the great cities of the West, where they handle a full line of agricultural implements in addition to those of their own manufacture.

The Hill Double Lock Safety Switch Company, at Chicago, will manufacture railway supplies; capital stock, \$25,000; incorporators, John J. Hill, W. H. M. Hill and D. H. Curtis. The Carver & Steele Mfg. Company, at Harvey, Cook County, Ill., will manufacture harvesting machinery, agricultural implements, &c.; capital stock, \$500,000; incorporators, Charles F. Craver, Alonzo Steele, David Kelly and A. H. Craver.

The American Safety Coupling Company of Minneapolis, Minn., capitalized at \$500,000, have filed articles of incorporation.

The Reeves Boiler Company of Niles, Ohio, have received an order for the construction of 25 tank cars for the Manhattan Oil Company.

The Howe Stove Works, which are in process of erection at Tallapoosa, Ga., are nearing completion, and it is thought will be ready for operation by November 20.

A. B. Peterson, Nap Lodor and others, Chattanooga, Tenn., have applied for a charter for the Frictionless Metal Company, and will erect a plant for the manufacture of metal for bearings, &c.

We have received from Joseph T. Ryerson & Son of Chicago a nickel-plated miniature McGregor boiler brace. The brace of which this is a representation is made by special machinery of one piece of open-hearth flange steel plate of 60,000 pounds tensile strength in one heat and without a weld, afterward annealed to secure uniformity. The usual form of boiler brace is made of two or more pieces of bar iron welded together in three to seven heats. The manufacturer claims many advantages for the McGregor steel brace over the ordinary iron brace.

## TRADE REPORT.

### Chicago.

(By Telegraph.)

Office of *The Iron Age*, 50 Dearborn street, }  
CHICAGO, November 18, 1891.

The outlook now has rather more encouraging features. Railroad interests are looking up at last, and the demand from that source promises to realize the expectations so long entertained. Car builders, rail makers and general supply manufacturers are receiving more inquiries and orders.

**Pig Iron.**—The price of Lake Superior Charcoal is attracting large consumers, who have been biding their time until values reached a temptingly low level. One sale is reported to have been made of about 10,000 tons to a plow manufacturer. Other heavy consumers are testing the strength of sellers with the evident purpose of purchasing round lots if they can get favorable prices and terms. Several sales of 100 to 500 tons are reported at special prices. Despite the inquiry and the large tonnage moved, the Charcoal market has the appearance of dullness because the demand is not of a general character. Our quotations represent the asking prices, and some brands cannot be bought under them, but other brands are being sold at concessions, according to the character of the contract made. Sales of local Coke Iron are reported, but the demand is not up to the capacity of the furnaces, and considerable stock is accumulating. Numerous consumers are also requesting deliveries on old contracts postponed, and making the furnaces carry the iron for them. Weakness is reported in No. 2 Foundry, but other grades are fairly firm. Prices have given way at last on Southern Coke, especially on No. 2 Foundry. Concessions of 25¢ @ 50¢ are offered on our quotations, especially on sales for early delivery. A change has also occurred in Southern makers' views with regard to next year, and several leading companies are now very willing to sell at present prices for the greater part of 1892. Quotations are as follows, f.o.b. Chicago:

Lake Superior Charcoal.....	\$17.00 @	\$17.50
Local Coke Foundry, No. 1.....	15.50 @	16.00
Local Coke Foundry, No. 2.....	15.00 @	15.25
Local Coke Foundry, No. 3.....	14.50 @	15.00
Local Scotch.....	16.00 @	16.50
Ohio Strong Softeners.....	17.75 @	18.25
Southern Coke, No. 1.....	15.75 @	16.25
Southern Coke, No. 2.....	15.00 @	15.25
Southern Coke, No. 3.....	14.25 @	14.50
Southern, No. 1, Soft.....	15.00 @	15.75
Southern, No. 2, Soft.....	14.50 @	14.75
Southern Gray Forge.....	14.00 @	....
Southern Mottled.....	13.50 @	14.00
Tennessee Charcoal, No. 1.....	18.00 @	....
Alabama Car Wheel.....	20.50 @	21.50
Coke Bessemer.....	17.00 @	....
Hocking Valley, No. 1.....	17.00 @	18.50
Jackson County Silvery.....	17.50 @	18.00

**Spiegeleisen.**—Is moderately active at unchanged prices.

**Bar Iron.**—Several car orders are in the market based on actual contracts taken for cars. Some of the cars recently ordered are for Northern fast freight lines, but Southern railroads have been quite liberal buyers. Jobbers' specifications are not being freely offered, but there are indications that they will soon reappear in the market. The coal strike in Indiana has caused some of the local mills to shut down, and they have been forced to purchase from outside mills to fill their contracts, which has improved their condition somewhat. There is now a good prospect of enough business to keep the Western mills moderately active through the winter. Manufacturers quote about 1.75¢, extras, Chicago, or 1.55¢ at mill in Mahoning Valley. Jobbers are selling at 1.85¢ from store and report continued dif-

ficulty in getting deliveries on old contracts from the mills.

**Other Manufactured Iron.**—Structural Material is in very good demand from builders and a moderate inquiry is reported for bridge work. Plates are dull and selling as low as ever. Black Sheets are moving freely from stock, but mill orders are confined to an occasional carload of Steel Sheets for sheeting, special shapes for agricultural works, and thin gauges for trunk makers. Galvanized Iron is moving briskly, but jobbers are now selling Juniata at 65 and 10 % off.

**Merchant Steel.**—The trade is limited, as is generally expected at this season, but makers are disposed to force business in some lines. Bessemer Bars are being offered very low, and some specialties in Spring Steel are badly demoralized. The standard makers continue to quote former prices, and insist that they are not obliged to meet reckless competition, which is, perhaps, wise policy when there is so little business to be secured.

**Track Supplies.**—Steel Rail inquiries for next year are characterized as brisk by local sellers. Railroad managers seem to agree with manufacturers that the present is a good time to buy. Southern roads are in the market for fair-sized lots for this year's delivery. Prices range from \$31 up, according to the character of the order. A number of large Splice Bar orders are in sight, and sellers' views are stiffening. Quotations are about 1.80¢ @ 1.85¢. Track Bolts and Spikes are unchanged.

**Old Rails and Wheels.**—Old Iron Rails are lower. A local customer refused to pay even \$21.50 for a single carload. Early in the week a sale of 1000 tons was made at \$22 at an interior point, but later other sales were made in the same locality at \$21.50. Old Steel Rails are worth \$14 @ \$16. Old Car Wheels are wanted, but buyers are not willing to pay \$16, which holders ask, except for an occasional small lot.

**Scrap.**—Cast Scrap is about the only old material being sold by dealers here. Local consumers are taking it at \$12 @ net ton. Wrought Scrap can be had at very low rates, but nobody seems to want it. No transactions are occurring to fix values.

**Metals.**—Copper is still drooping. Carload lots of Lake are now selling at 11½¢, and casting brands 11½¢. Spelter is unchanged at 4.70¢. Inquiry for Pig Lead is chiefly confined to car lots for immediate needs. Sales will aggregate about as last week, 600 tons at 4¢ @ 4.05¢, according to brand and delivery.

### Louisville.

LOUISVILLE, KY., November 16, 1891.

**Pig Iron.**—The market remains very quiet; there is but little inquiry for Pig metal, nor is there any special effort being made on the part of furnaces to sell. Buyers as a rule seem to be fairly well supplied and not inclined to add to their stocks until after the first of the year, and the majority of the furnaces seem to be comfortably sold up for the next few months, and, notwithstanding the accumulation in stocks noted for last month, and the enormous production reported at the present time, there is no special weakness discernable. Car-Wheel Irons continue to be offered at low prices for this year's delivery, but where parties desire deliveries running for six months or the whole of next year considerably higher prices are being asked and there is a firmer feeling. We quote for cash, f.o.b. cars, Louisville:

Southern Coke, No. 1 Foundry....	\$14.50 @	\$15.00
Southern Coke, No. 2 Foundry....	13.75 @	14.25
Southern Coke, No. 3 Foundry....	13.25 @	13.75
Southern Charcoal, No. 1 Foundry....	16.00 @	17.00
Southern Car Wheel, stand. br'nds	18.00 @	20.00

## Philadelphia.

Office of *The Iron Age*, 220 South Fourth St.,  
PHILADELPHIA, Pa., November 17, 1891.

The condition of the market is about the same as during several weeks immediately preceding. There is no perceptible change in prices, or in demand, or in new work coming out, or in the general outlook, so that the usual inquiry is, when are things likely to change, and in view of so many favorable influences, why is it that this dead level of monotony is so protracted? Even these inquiries have been in a large measure anticipated and answered, and so far with apparent correctness, and for the most part, there is very little more that can be said, and nothing that has been said needs to be unsaid, or needs in any degree to be modified. But the position is an enigma nevertheless, and although it may not be possible to solve the problem satisfactorily, it will do no harm to consider the influences which have not only delayed the confidently expected improvement, but which are beginning to raise doubts whether there is to be any improvement at all. It is not worth while to discuss whether the natural conditions are favorable or not, that being too obvious and too generally conceded to need any discussion whatever.

There is another feature, however, which requires consideration, and which, while being to some extent inimical to any premature movement, may not be unfavorable to the ultimate outcome. We allude to the large increase in production. There is certainly more Pig Iron being made than is being consumed, and there are more mills running than are necessary to meet the demand for finished material; prices show that. But after all, the question is simply one of proportion. If the demand during 1892 is to be no larger than that during 1891, the sooner we curtail production the better for all concerned. If it is to be as much larger as conditions appear to warrant, then our present production is none too large. It will strengthen our reserves of material, and will prevent any such wild and senseless fluctuations as we had 10 or 12 years ago, and lay the foundation perhaps for years of uniform prosperity.

During the "boom," purchases of foreign material were nearly equal to our entire home production, and for quite a while prices were maintained at an advance of about 50 %, so that the advantages which legitimately followed good crops were almost immediately neutralized by foreign imports and high prices. In many respects the conditions are more favorable to-day than they were in 1879-80. Crops are as large in proportion to population as they were at that time, while the foreign demand is such that we can get a great deal more money for what we have to sell; another point is, that we shall keep that money in our own country this time. There will be no need, as was supposed in 1879-80, after taking 2,000,000 or 3,000,000 tons or more of Pig Iron, to scour the world over to pick up all the old Iron that could be laid hands on at double what it was worth. In 1892 we shall have the Iron right here, made in our own furnaces, finished in our own mills and obtainable at low prices. Hence the period of prosperity, somewhat tardy in making its appearance, will probably be all the stronger and all the longer when it does come.

It may not be out of place in this connection to suggest some of the outside influences which probably have done much and are still doing a great deal to retard general improvement, particularly in the Iron and Steel trades. We refer to the unsettled and unfavorable condition of affairs in Europe. This country, by a peculiar combination of circumstances, cannot be seriously injured by anything likely to

happen in other countries, but we shall not have their active assistance as in former times. They recognize the magnificent prospect in this favored land, but they are in no condition to avail themselves of it, but, on the contrary, take opportunity of selling out on every favorable turn. This undoubtedly affects the demand for new issues of bonds, &c., and prevents the railroads from entering the markets as they would in ordinary times.

We cannot expect any great improvement in Iron until the Rail mills and car shops get busy, and they cannot come until they get money, either from earnings, or from advances or from the sale of securities. The promise of improvement in Iron is therefore pretty well founded, because if the two latter alternatives are not immediately available, the former is rapidly becoming of increasing importance, and most likely with the result that when money is no longer necessary it will be thrust at them in every direction. It does not seem unreasonable, therefore, to assume that when the good times get fairly started they will have a longer run than usual, and instead of a few months of prosperity we may have years, simply because it starts legitimately, and can be carried on without regard to foreign assistance, or without the danger of being overwhelmed by foreign material.

**Pig Iron.**—The market may be described as being one of the stubbornest experienced in years. Makers cannot get prices up, neither can consumers get prices down, so that for all practical purposes things are just about as they were two or three months ago. Production is increasing, and for the time being is a little ahead of consumption, but even that feature is offset by the conviction that all the Iron that can be made will be called for some time during the coming year. The objection to piling up Iron is therefore less marked than usual, and is further shown by the unwillingness of makers to accept even the merest fraction less than ordinary quoted rates. How far makers are warranted in this position is for the future to determine; we simply state the fact. Bids for round lots at 25¢ below the market have been refused by several large concerns, and so far as known the inside figures quoted herewith are absolutely rock bottom. The only shadow of a concession is in accepting orders for the first quarter of 1892 at current quotations; several, probably all, the companies have notified their agents to arrange for about one-half of the product, leaving the balance to take care of itself. Under these conditions quotations are about as follows, varying according to brand, point of delivery, &c.:

Ohio Softeners, No. 1x	\$18.75	@	\$19.00
Ohio Softeners, No. 2x	17.75	@	18.00
Standard Penna, No. 1x	17.75	@	18.00
Standard Penna, No. 2x	16.00	@	16.50
Medium Penna, No. 1x	17.00	@	17.50
Medium Penna, No. 2x	15.75	@	16.00
Virginia, No. 1x	17.00	@	17.25
Virginia, No. 2x	15.50	@	16.00
Standard Neutral All-Ore Forge	14.25	@	14.75
Ordinary Forge Cinder mixed	13.50	@	14.00
Hot-Blast Charcoal	20.00	@	22.00
Cold-Blast Charcoal	24.00	@	27.00

**Muck Bars.**—Market dull and unchanged, with only a few unimportant transactions at about \$26.50, delivered, and for a strictly first-class article about \$27.

**Steel Slabs and Billets.**—A little more activity has been developed in this department, but without much change in prices. A sale of 1000 tons of Nail Slabs was closed at a trifle under \$26.50, delivered to mill on the Schuylkill, immediate specifications and prompt cash settlement; and another lot of 2000 tons for a Plate mill near-by, at a trifle over \$26.50 for deliveries covering the first quarter of 1892. As a rule, however, manufacturers require higher prices, and in the majority of cases name \$27.25 and upward as their ideas of

value, and are not pushing for business even at the higher figures mentioned.

**Steel Rails.**—There is nothing of special interest in the market to-day. The Pennsylvania order has not been followed by any others of importance, but the mills manage to keep pretty fairly employed at unchanged prices, say \$30, at mills. While there is nothing immediately in sight likely to cause much improvement, it is believed that an increasing volume of business is bound to be forthcoming in the near future.

**Bar Iron.**—There is little or no change in this department, and mills are just dragging along at about the same old prices. From outside points more or less cutting is reported, but at city and nearby leading mills there is a fair degree of activity at from 1.70¢ to 1.85¢ city or 1.60¢ to 1.65¢ at interior points.

**Plates.**—There is rather more inquiry, in addition to which a good deal of business has been sent in from the smaller trade, and to some extent for ship and tank work. Mills are moderately well employed, but without getting much work for delivery after this and the coming month. Prices irregular and nominally unchanged, but on desirable orders liberal concessions can be had. The usual asking prices are about as follows:

	Iron.	Steel.
Tank Plates....	1.90 @ 2.00¢	2.00 @ 2.10¢
Refined.....	2.30 @ 2.30¢	2.10 @ 2.20¢
Shell.....	2.30 @ 2.40¢	2.25 @ 2.35¢
Flange.....	3.20 @ 3.30¢	2.50 @ 2.75¢
Fire-Box.....	4.00 @ 4.25¢	3.00 @ 3.50¢

**Structural Material.**—No definite increase in the demand, but there is a large amount of business in prospect, and things are likely to be quite active at an early date. Meanwhile prices are a little irregular, but are usually quoted about as follows: Angles, 1.95¢ @ 2.05¢; Sheared Plates, 1.90¢ @ 2¢, and in some cases equal prices, to about 1/10¢ more, for Steel, according to requirements. Tees, 2.5¢ @ 2.6¢; Beams and Channels, 3.1¢ for either Iron or Steel.

**Sheets.**—The demand is somewhat disappointing, but stocks are not accumulating to any extent, and manufacturers expect to close the year with not more than the usual assortments on hand. Prices irregular, but on best makes quotations are about as follows:

Best Refined, Nos. 14 to 20.....	3.00¢ @ 3.10¢
Best Refined, Nos. 21 to 24.....	3.10¢ @ 3.15¢
Best Refined, Nos. 25 to 26.....	3.20¢ @ 3.30¢
Best Refined, No. 27.....	3.40¢ @ .....
Best Refined, No. 28.....	3.50¢ @ .....
Common, 1/4¢ less than the above.	

Quotations given as follows are for the best Open-Hearth Steel, ordinary Bessemer being about 1/4¢ lower than are here named:

Best Soft Steel, Nos. 14 to 20.....	3¢ @ 3 1/4¢
Best Soft Steel, Nos. 21 to 24.....	3 1/4¢ @ .....
Best Soft Steel, Nos. 25 to 26.....	3 3/4¢ @ .....
Best Soft Steel, Nos. 27 to 28.....	4¢ @ .....
Best Bloom Sheets, 1/4¢ extra over the above prices.	
Best Bloom, Galvanized, discount....	@ 67 1/2 %
Common, discount.....	@ 70 %

**Old Material.**—There is a little better demand, but it is somewhat spasmodic, and, although there is more inquiry, prices have not stiffened to any appreciable extent. The usual asking prices remain as follows: Iron Rails, \$21.50 @ \$22.50; Steel Rails, \$16 @ \$17, delivered; No. 1 Railroad Scrap, \$20.50 @ \$21, Philadelphia, or for deliveries at mills in the interior \$20.50 @ \$21.50, according to distance and quality; \$14.50 @ \$15.50 for No. 2 Light; \$14 @ \$14.50 for best Machinery Scrap; \$13.50 @ \$14 for ordinary; \$14.50 @ \$15.50 for Wrought Turnings; \$10 @ \$10.50 for Cast Boring, and nominally \$23 @ \$25 for Old Fish Plates, and \$16 @ \$16.50, delivered, for Old Car Wheels.

**Wrought-Iron Pipe.**—There is a steadier feeling, and prices appear to be hard-

ening, discounts on carload lots being about as follows:

Butt-Welded Black.....	57½ %
Butt-Welded Galvanized .....	47½ %
Lap-Welded Black.....	67½ %
Lap-Welded Galvanized.....	55 %
Boiler Tubes, 2½ inch and under.....	52½ %
Boiler Tubes, 3 to 6 inch.....	60 %
Boiler Tubes, 7 inch and larger.....	55 %

L. & R. Wister & Co. announce that the Sterling Coal Company have appointed them agents for the sale of their Powelton (Sterling Vein) Semi-Bituminous Coals. In sending out their circulars they say: "This Coal, by reason of its remarkable purity and small amount of residua, is unequaled as a fuel in the manufacture of the finest grades of Steel and Iron, while its steam generating properties have brought it into general use on ocean steamships, steamboats, tugs, locomotives and stationary engines."

Cincinnati.

(By Telegraph.)

Office of The Iron Age, Fourth and Main Sts., CINCINNATI, November 18, 1891.

**Pig Iron.**—There have been no large transactions during the week, but only a consumptive order trade for single carloads, which is freely met at previous prices and is not very large in the aggregate, but, on the other hand, there is no urgency to sell. Purchasers claim that they could buy Gray Forge at \$9.75 at the furnace. If this is so, it is exceptional and for early delivery for cash. The market may still be fairly quoted at \$10, and for same, considerable quantities, even more than this is still obtained. No. 3 Foundry Iron is exceptionally dull and the quotations might be shaded, while No. 2 is not in excessive supply and is firm. No. 1 Foundry is scarce. There is no movement in Charcoal Iron. The difficulty in securing cars for early deliveries to some regions of the country continues, but it is less stringent, for there are numerous applications to have deliveries on maturing contracts postponed, indicating that some purchasers have overbought. There is still a liberal consumption of Pig Iron in progress, but in the light of accumulating stocks there is no inducement for buyers to anticipate their wants. Iron Pipe works are reducing their output, as the season is so far advanced that the demand is falling off, and not much demand for Pig Iron can be expected from them for some months to come. Collections continue to be fairly satisfactory, and the Iron trade is apparently in a sound and healthful condition, but quiet markets are anticipated for the remainder of the year. Quotations unchanged as follows:

Foundry.		
Southern Coke, No. 1.....	\$15.25 @	\$15.75
Southern Coke, No. 2.....	14.00 @	14.50
Southern Coke, No. 3.....	13.25 @	13.50
Ohio Soft Stone Coal, No. 1.....	16.50 @	17.00
Ohio Soft Stone Coal, No. 2.....	15.50 @	16.50
Mahoning and Shenango Valley.....	17.00 @	17.50
Hanging Rock Charcoal, No. 1.....	20.00 @	21.00
Hanging Rock Charcoal, No. 3.....	19.00 @	20.00
Tennessee and Alabama Charcoal, No. 1.....	16.50 @	17.00
Tennessee and Alabama Charcoal, No. 2.....	15.50 @	16.00
Forge.		
Gray Forge .....	12.75 @	13.00
Mottled Neutral Coke.....	12.25 @	12.50
Car Wheel and Malleable Irons.		
Standard Southern Car Wheel.....	19.25 @	19.75
Hanging Rock, Cold Blast.....	25.00 @	26.00
Lake Superior Car Wheel and Malleable .....	18.75 @	19.25

The Sloss Iron and Steel Company of Birmingham, Ala., announce that they have appointed Chamberlain, Turney & Co. agents for the sale of their Iron.

Pittsburgh.

Office of The Iron Age, Hamilton Building, Pittsburgh, November, 17, 1891.

**Pig Iron.**—There has been no very marked change in the situation during the past week with the exception that consumers are more disposed to buy and producers less anxious to sell. There has been a very good business the past week, but at very low prices, and some furnacemen are now refusing to make additional contracts at present prices. City furnaces continue to do about all the business, for the reason that furnaces at a distance can do better at home or elsewhere. Southern Iron, for the same reason, is almost lost sight of, and Southern furnacemen are marketing their product elsewhere. Mahoning and Shenango valley furnacemen are disposing of their Iron at home and at Cleveland, Chicago, Detroit and other points north and west of there, while the furnaces east of here in the Coke and Anthracite regions are disposing of their Iron at Philadelphia and other points east. Several lines, both of Mill and Bessemer Iron, have been sold for delivery next year, and it is very generally conceded that there is not much risk on the part of consumers in buying either for present or future delivery, although in view of the very large production, there is not much prospect of any immediate advance. We quote prices as follows:

Neutral Gray Forge.....	\$13.50 @	\$13.65, cash
White and Mottled.....	13.00 @	13.25, "
All-Ore Mill .....	14.00 @	14.50, "
No. 1 Foundry .....	16.00 @	16.25, "
No. 2 Foundry.....	15.00 @	15.25, "
No. 3 Foundry.....	14.50 @	14.75, "
No. 1 Charcoal Foundry .....	21.50 @	22.00, "
No. 2 Charcoal Foundry .....	20.50 @	21.00, "
Cold-Blast Charcoal.....	25.00 @	26.00, "
Bessemer Iron.....	15.00 @	15.25, "

So far as we have been advised, there have been no sales of Mill Iron under \$13.50, cash, and \$15, cash, is regarded as bottom on Bessemer. There are but few sellers at that price. It may be noted in this connection that Pig Iron never sold so low in this market before as at the present time.

**Muck Bar.**—Dullness continues, and there does not appear to be much prospect of any immediate improvement. May be quoted at \$26 @ \$26.25, cash; offering freely at \$26, and might be bought for less.

**Manufactured Iron.**—Possibly not so much new business, but manufacturers are working pretty full, some of them being considerably behind with their orders; however, business usually commences to drop off at this season of the year. Manufacturers complain more of price than the want of business. Bar mills both here and in the valley, are still pretty well employed and for desirable orders prices are quoted at 1.67½¢ @ 1.70¢ here and 1.60¢ at the valley mills, 60 days, 2 % off for cash. It is well to state that only very desirable orders can be placed here at 1.67½¢. Plate and Tank Iron is quotable at 2¢ @ 2.05¢ and Sheet Iron is now quoted upon a basis of 2.70¢ for No. 24, at 60 days, 2 % off for cash. Skelp Iron is quoted at 1.67½¢ @ 1.70¢ for Grooved and 1.87½¢ @ 1.90¢ for Sheared, four months, 2 % off for cash.

**Nails.**—Cut Nails are still quoted at \$1.55 @ \$1.60 for 30¢ to 35¢ average, in the Wheeling district, 60 days, 2 % off for cash. Wire Nails for immediate or near-by delivery are now being sold at \$1.75, f.o.b. at factory, 60 days, 2 % off for cash. This is a drop of 5¢ as compared with the price quoted a week ago. It is intimated that a desirable order might be placed below the price quoted, but so far as we are advised there have been no sales made below \$1.75, at which price it is claimed there is little or no margin for profit. The forming of a syndicate is still favored, and it is said that additional conferences have been held with this object in view.

**Wrought-Iron Pipe.**—There is no improvement to report and not likely to be until toward spring, as dullness usually obtains during the winter season. While the syndicate prices are still quoted, it is intimated that they are not in all instances being adhered to. The syndicate discounts are as follows: On Black Butt Pipe, 57½ %; do. Galvanized, 47½ %; on Black Lap, 67½ %; on Galvanized do., 55 %. Boiler Tubes, 2½-inch, inclusive, 55 %; 3-inch, 65 %; Casing, all sizes, 55 %.

**Structural Material.**—While there is not so much new business, mills still have all they can do working up former contracts. The weather has been unusually favorable all fall for building operations, and contractors have been taking advantage of the same, and a great deal of work has been accomplished that could not have been done had the weather been unfavorable. Prices remain unchanged, as follows: Channels and Beams 3.10¢; Angles, 2¢; Tees, 2.60¢; Steel Sheared Bridge Plates, 2.15¢ @ 2.20¢; Universal Mill Plates, 2¢ @ 2.05¢; Refined Bars, 1.80¢ @ 1.85¢.

**Merchant Steel.**—There is a continued fair degree of activity, but prices remain unchanged, with the exception of Bessemer Machinery and Tire Steel, our quotations on which we reduce slightly. Crucible Tool Steel, 6¼¢ @ 7¢; do. Spring, 4¢; do. Machinery, 4½¢ @ 5¢; Bessemer Machinery, 2.10¢ @ 2.25¢; Tire Steel, 2.10¢; Toe Calk, 2.40¢ @ 2.50¢; Steel Bars, 1.80¢ @ 1.85¢.

**Billets and Slabs.**—There has been considerable activity the past week, sales of several thousand tons have been reported at prices ranging from \$24 to \$24.50 and \$24.75, f.o.b. at makers' mill. Manufacturers regard \$24 @ \$24.25 as being extremely low prices, and some of them refuse to quote below \$24.50. It is alleged that some of the brokers here are making an effort to "work" the market by reporting sales that were never made, as well as fictitious prices.

**Steel Plates.**—There is a continued good demand and prices are steady as quoted: Fire Box, 3.85¢ @ 4.25¢; Tank, 2.05¢ @ 2.10¢; Shell, 2.35¢; Flange, 2.40¢ @ 2.50¢.

**Barb Wire.**—No change in prices—at \$2.45 for Painted, and \$2.95 for Galvanized, f.o.b. at factory, in Pittsburgh or Cleveland district. It is rumored that a couple of firms in the syndicate contemplate withdrawing therefrom.

**Wire Rods.**—No sales reported here for several weeks, and it is difficult to give reliable quotations in consequence; may be quoted nominally at \$34 @ \$34.50, f.o.b. at makers' works.

**Old Rails.**—There is a fair business at about former prices. Sales of Iron Rails to valley consumers at \$23.25 @ \$23.50, and Steel at \$16.50 @ \$17 for short and \$17.50 @ \$18 for long pieces. There are but very few Old Iron Rails used at Pittsburgh.

**Ferromanganese.**—Sales of domestic 80 per cent. at \$65, cash. This has been the ruling price for several weeks for domestic, and imported cannot be sold much below that price in this market.

**Steel Rails.**—There is a continued fair demand, with the syndicate price adhered to—\$30, f.o.b. at mill. Rumor has it that the Carnegie firm got 20,000 tons of the contracts for 70,000 recently made by the P. R. R.

**Railway Track Supplies.**—There is a continued good demand, with prices as follows: Spikes, 2.15¢, f.o.b. at makers' works; Splice Bars, 1.70¢ @ 1.80¢; Track Bolts, 2.65¢ with Square and 2.75¢ with Hexagon Nuts. As will be noted, we have reduced our quotations slightly on Splice Bars and Track Bolts.

**Old Material.**—Business is generally reported slow, while price remain about as last quoted. No. 1 Railroad Wrought Scrap, \$19.50, net ton; Cast Scrap, \$13 gross ton; Iron Axles, \$25 @ \$26, gross; Steel Bloom and Rail Ends, \$18.

**Connellsville Coke.**—There is a continued fair demand; no change in prices for several months.

Carnegie, Phipps & Co., Limited, Pittsburgh, have issued a notice to their patrons calling attention to the fact that railways now charge more than the ordinary rates of freight for steel and iron material over 20 feet in length, too bulky to be loaded in a box car, or of such length as to require two or more cars for transportation, except in cases where the weight of the consignment is sufficient to net certain established minimum freight charges. Prices covering delivery are based upon the ordinary freight rate on the actual weight of the shipment unless specially arranged otherwise, and in cases where shortages in shipments are found to exist it is requested that consignees will bring the same to the attention of the railway company and secure the indorsement of the freight agent as to such shortage on the original paid freight bill. Unless freight bills so indorsed are sent to them promptly the firm state they are unable to secure consideration of claims for loss in transit on the part of the railways.

## Cleveland.

CLEVELAND, November 16, 1891.

**Iron Ore.**—The situation has not materially changed. Transportation rates are still at the top notch of endurance, and the season is now so far advanced that there seems little likelihood of any alterations in the interest of the buyers. Still, the market has not been altogether inactive during the past week. Sales of small amounts of non-Bessemer Hematites are reported at figures close to \$4, f.o.b. cars lower lake ports, and a few hundred tons of the best grades of No. 1 Specular and Magnetic Bessemer are also said to have been let go at about \$6, same conditions. These sales, however, are not regarded as of any great importance. There is, of course, considerable speculation regarding next season's output and prices, but very little serious consideration appears to have been given the subject thus far. During the past week about 30,000 tons of new Ore were unloaded at Cleveland, as compared with 40,000 tons for the corresponding week in 1890. The receipts at all lake ports for the same week were close upon 95,000 tons, as compared with 125,000 for the same week in 1890. At the best it is admitted that shipments will not continue beyond Thanksgiving week, if, indeed, they last till then. The total receipts for the year are variously estimated at from 6,250,000 to 6,750,000 tons. Something regarding next season's sales may be done within the next two or three weeks, but it seems scarcely probable. The Escanaba rate continues at \$1.25, with the Marquette, Ashland and Two Harbors rate correspondingly high. Eastern furnacemen are asking for quotations for Gogebic and Menominee Bessemer.

**Pig Iron.**—There does not seem to be any appreciable increase in demand or in the firmness of the market. It is admitted everywhere that prices will go no lower, but whether they will advance or not is another question. Dealers believe that they will and at no distant day, too, but they have expressed the same feeling of confidence for the past two months. A thorough canvass of the Iron district to-day fails to reveal any amount of trade worthy of special mention. There have been a few sales of No. 1 Foundry Iron and of the more desirable grades of Besse-

mers, but at substantially the same quotations prevailing during the preceding six weeks.

**Old Rails.**—Old American Rails at \$23.50 @ \$23.75 are in some demand, and several sales were recorded last week. Old Wheels are also selling a bit more freely. The demand for Old Rails seems to come from the Mahoning Valley.

**Scrap.**—An occasional sale of No. 1 Railroad Wrought at \$19.25 @ \$19.50 is reported, but the market is not very active and the demand is somewhat limited. Cast Scrap at \$13.50 @ \$13.75 is in some demand.

**Manufactured Iron.**—No complaints are heard, the mills being so well supplied with orders; still, business could be considerably improved. Sheets are scarce and valuable. Common Bar Iron at 1.70¢ @ 1.75¢ is inquired for with considerable freedom.

**Barb Wire.**—The demand is good, but manufacturers decline booking orders for delivery beyond next month. Galvanized is quoted at \$2.95 @ \$3 in car lots, and Painted at \$2.45 @ \$2.50.

**Nails.**—The demand for Steel Wire Nails at \$1.95 @ \$2, in stock, is still good, and otherwise the market is devoid of special features.

## St. Louis.

OFFICE OF The Iron Age, 214 N. Sixth st.,  
ST. LOUIS, November 16, 1891.

**Pig Iron.**—A review of the past week does not indicate any change worthy of notice. Sales have been few and at prices that are somewhat lower than those quoted herewith. General business does not improve as rapidly as was expected, and in some lines serious depression has set in, which is having its influence on the Iron trade. Forge Irons have been somewhat active, but buyers expect to do better than to day's prices and are only buying in limited quantities to meet actual requirements. The outlook is not particularly bright and consumers are disposed to defer purchases until after January 1. Car manufacturers are busily employed, and orders aggregating 2000 cars have been placed during the past week, and it is understood that these orders will be duplicated, so that trade in this particular line is very satisfactory. The stove foundries are also well employed; but outside of those lines just mentioned trade is unusually depressed. Prices are shaded, and unless the demand shows increased activity a lower range of values will doubtless result. We quote as follows for cash, f.o.b. St. Louis:

Southern Coke, No. 1 Foundry,	\$15.25 @ \$15.50
Southern Coke, No. 2 Foundry,	14.25 @ 14.50
Southern Coke, No. 3 Foundry,	13.50 @ 13.75
Gray Forge.....	13.00 @ 13.25
Southern Charcoal, No. 1 Foundry.....	17.00 @ 17.50
Southern Charcoal, No. 2 Foundry.....	16.50 @ 16.75
Missouri Charcoal, No. 1 Foundry.....	15.50 @ 16.00
Missouri Charcoal, No. 2 Foundry.....	15.00 @ 15.50
Ohio Softeners.....	17.75 @ 18.75

**Bar Iron.**—Mills continue to complain regarding the scarcity of business. There is some chance of improvement, however, as the railroads are negotiating for material, and the market is likely to feel the effect of this inquiry before many days. Lots from mill on cars at East St. Louis are quoted at 1.75¢; small lots from store at 1.85¢ @ 1.90¢ according to circumstances.

**Barb Wire.**—No change to note either in price or demand. The Columbia Patent Company have evidently arranged their programme satisfactorily, as business so far as they are concerned is moving very smoothly. Prices are unchanged, as

follows: Painted, 2 70¢; Galvanized, 3 20¢. Terms, 60 days, or 3 % discount for cash in ten days.

**Wire Nails.**—Are unsettled and mills quote \$1.95 for carload lots delivered f.o.b. cars St. Louis. It is thought that the market has reached bottom, and that higher prices will shortly be in order. Jobbers quote \$2.10 @ \$2.15 for lots from store.

(By Telegraph.)

**Metals.**—The Pig Lead market fails to show any improvement; November deliveries are quoted at 3.95¢, at which price several hundred tons have changed hands. The market to-day looks top heavy, but it is difficult to make a prediction with any degree of accuracy, although indications point to lower prices. Spelter is heavy, and sales have been made at 4.50¢ for November delivery; offerings are made for delivery extending through December, January and February at this price, but consumers are either well supplied or are anticipating a lower range of prices, as they refuse to negotiate at this price.

## Detroit.

WILLIAM F. JARVIS & Co., Detroit, Mich., under date November 16, 1891, say: The carload trade for Foundry Iron continues, but no large business has been visible in this market, with the exception of one deal for a round lot of Southern Foundry and Forge Iron, which went at ruling figures. This is for delivery over the first six months of 1892. The large rate of production, which is known and seen by both buyers and sellers, has induced those furnaces who were inclined to hold back on future delivery orders to book at least a portion of their output for next year, and hence the offerings are more free, particularly in Southern Iron, than they have been heretofore. The Lake Superior Charcoal trade for the season is very nearly closed, as this is the last week of navigation upon the lakes, and most of the Eastern buyers depending upon the so-called summer shipment furnaces will be stocked to a greater or less extent until spring. Altogether this season's trade in this particular metal can hardly be said to have been satisfactory, at prices starting in at about \$18.50 @ \$18.75 at Buffalo in April and May and closing at the present time at \$17.25 @ \$17.50, cash, at that point. We now think that the production will be curtailed to a considerable extent by these same summer shipment furnaces overhauling their stacks and putting in necessary repairs at this time. The car industry seems to be a busy one; rumors for large orders for general equipment are frequently heard and authenticated, and there are prospects for a much larger business during the winter months for Wheel and Malleable Iron. The market really shows no change in price whatever, and the quotations we give are repeated from last week, and are as follows:

Lake Superior Charcoal, all numbers.....	\$18.00 @ \$18.50
Lake Superior Coke Foundry, all ore.....	17.50 @ 18.00
Lake Superior Coke, Bessemer.....	16.50 @ 17.00
Ohio Blackband (40 per cent.).....	18.00 @ 18.50
Southern No. 1.....	16.25 @ 16.50
Southern Gray Forge.....	14.00 @ 14.50
Jackson County (Ohio) Silvery.....	18.25 @ 18.75

The Allentown Rolling Mills have recently increased their spike plant by the addition of a number of automatic machines, so that now their capacity is about 20 tons per day. They make a specialty of rolled-point railway or track spikes, but can turn them out to any desired pattern. They are also making an extra effort in their switch and signal department.

They can turn out the most complicated systems of interlocking switches and signals complete in every detail, and are particularly well fitted to make intricate and difficult work. Edward Corning & Co., Philadelphia, Boston and New York, are the selling agents for these mills,

## New York.

Office of *The Iron Age*, 96-102 Reade street, New York, November 13, 1891.

**American Pig.**—As indicating the position of the leading producer for this market, we may note that the Thomas Iron Company have this week sold 3000 tons of Foundry Iron to a consumer, at a price to be determined later on. Mr. Clarke, president of the company, states, however, that he has guaranteed that there shall be no advance above the price now ruling. Southern agents report the market very dull. We quote Northern brands, \$16.75 @ \$18 for No. 1; \$16 @ \$16.50 for No. 2, and \$14 @ \$14.50 for Gray Forge. Southern Iron sells at \$16.25 @ \$17 for No. 1; \$15.50 @ \$16 for No. 2; \$14.50 @ \$14.75 for No. 3 Foundry, and \$14.25 @ \$14.50 for Gray Forge.

**Spiegeleisen and Ferromanganese.**—In all manganiferous material the market is very dull. Consumers have been filled up with Ferromanganese before the combination was broken and in some cases deliveries on contracts then made are being settled for at present quotations. We quote 10 to 12 %, \$23 @ \$24; 20 %, \$27 @ \$28, and 80 % Ferro, \$62 @ \$63.

**Billets and Rods.**—The market is lifeless, no transactions of any consequence having been closed in this section, while Pittsburgh drags along on a \$24 basis for 4-inch ordinary billets. We quote: Domestic Billets, \$27 @ \$27.50, delivered; foreign Billets, nominally, \$31 @ \$31.50, and Domestic Rods, \$36.50 @ \$37.50, tidewater.

**Steel Rails.**—In the East business has been very quiet during the past week, no transactions of magnitude having been closed. There is some inquiry, and some negotiations are pending, but there is not much prospect of booking heavy orders in the immediate future. The market, however, has been very active in the West. A representative of one of the large mills figures up that in the past two weeks the Western mills have closed for about 175,000 tons, winter and spring delivery, the quantity stated not including the Pennsylvania order. Even running at record rate this would amount to three months' rolling for the two great mills. We understand that practically all of these orders are for renewal work, so that the requirements for extensions have not yet appeared in the market. The November report of the Board of Control shows shipments up to the 1st inst. of 899,986 gross tons, standard sections, and orders booked up to the same date for 1891 delivery amounting to 1,062,073 tons. The deliveries during October were, therefore, 100,030 tons, while the sales footed up to 85,537 gross tons. Quotations remain steady at \$30 @ \$30.50 at Eastern mill, standard sections.

**Manufactured Iron and Steel.**—Only a moderate amount of new work is coming forward. During the week the smaller power house of the Broadway Cable Road has been placed. The larger house will soon be contracted for and is expected to require several thousand tons of iron work. The Plate market continues in a very unsatisfactory condition, with reports of low prices. It is reported that the Plates for a large vessel have been taken at a very low figure. We continue to quote: Angles, 1.90¢ @ 2.10¢; Sheared Plates, 1.85¢ @ 2.25¢; Tees, 2.40¢ @ 2.75¢, and Beams and Channels, 3.1¢, on

dock. Steel Plates are 1.9¢ @ 2.1¢ for Tank; 2.15¢ @ 2.30¢ for Shell; 2.40¢ @ 2.65¢ for Flange; 2.60¢ @ 2.75¢ for Marine, and 3¢ @ 3.25¢ for Fire Box, on dock. Bars are 1.7¢ @ 1.9¢, on dock. Scrap Axles are quotable at 2.15¢ @ 2.20¢, delivered. Steel Axles, 2.15¢ @ 2.25¢, and Links and Pins, 2.15¢ @ 2.20¢.

**Track Material.**—We quote 2.15¢ @ 2.25¢ for Spikes, 1.70¢ @ 1.90¢ for Fish Plates, and 2.80¢ @ 3¢ for Bolts, delivered.

**Merchant Steel.**—We quote Hot-Rolled Shafting 2¢ @ 2.10¢; Machinery, 2.10¢ @ 2.25¢; Tire, 2.15¢ @ 2.25¢, and Toe Calk, 2.20¢ @ 2.30¢, delivered.

**Old Material.**—There is nothing doing in Old Iron Rails; there is no stock offering and little demand, with quotations nominally at \$20 @ \$21. Low sales in the Mahoning Valley recently cut off the Western market completely. In Old Steel Rails business is light, and very low prices are named as those which might tempt buyers. The views of the latter do not seem to be above \$14 @ \$15.

Thos. Towne, formerly buyer for the Garvin Machine Company, has been appointed Eastern sales agent for the Union Drawn Steel Company of Beaver Falls, Pa., with offices in the Electrical Exchange, Liberty and Washington streets, New York. The company manufacture cold die rolled steel and iron shafting, piston rods, pump rods, slides and shapes, and are prepared to draw tool steel, for milling machine vise jaws, &c.

## Financial.

Trade is irregular, complaint of dullness being not infrequent and the aggregate volume of business is not equal to that of last year. Prices of commodities, too, are inclined to lag, cotton, wheat and other cereals being lower. But a tremendous volume of produce is passing into the channels of trade in exchange for cash and general merchandise, and the salutary effects will be fully realized in due time. Therefore the present may be recognized as a transitional period, and the outlook is full of encouragement. Now that the State canals are announced to close November 30 the eastward shipments from lake ports will soon close and throw a large traffic on the railroads, which in the West are already blockaded with traffic before the corn season is fairly opened. Railroad receipts for October show the heaviest gain since October, 1889, and this although the ore traffic was smaller than a year ago. Indicating the severity of the crisis in Brazil a leading exporter, in this city, of hardware and implements received the dispatch from Rio on Tuesday "Cancel all orders." The Russian grain ukase is out, so says the London Times, but the trade doubt it.

The cotton trade finds ocean accommodation at relatively easy prices, but other interests, and especially breadstuffs, have difficulty in getting room, and are compelled to meet steadily hardening rates. The preliminary Government statement of the exports for October makes it probable that the aggregate may exceed \$100,000,000 for the first time in the history of the country, and this despite a decrease in the value of cotton, provisions and oil, the gain being due to breadstuffs alone. Shipments were unusual both from New Orleans and the Pacific Coast. The comparatively lower export price of cotton makes a considerable difference. The promised large exports of meats to Germany has not materialized, but the French Chamber of Deputies decided to admit American pork at a reduced rate, and negotiations at Vienna are expected to result in the removal of the Austrian prohibition. Corn in this market advanced on the adoption

of mixed corn and rye bread for the German army.

The stock market was characterized by bearish demonstrations, from which there was a reaction on Friday, and on Saturday the tendency was still upward, despite some selling of the coal shares, which have suffered the most. Deleware and Hudson Canal sold as low as \$1.18½, against \$1.41½ in September last year. Foreign bankers profess to attach little importance to the disquieting reports from the Continent, and it is believed that the condition of financial affairs there is exaggerated. Nevertheless, influenced by weaker prices from London and by the disquieting reports of the financial situation at Paris and on the Continent, the market had a lower range.

United States bonds were quoted as follows:

U. S. 4½s, 1891, extended.....	90½
U. S. 4s, 1907, registered.....	116
U. S. 4s, 1907, coupon.....	116
U. S. currency 6s.....	111

In bank stocks 5 shares of Commerce sold at 184½ and 25 Central National at 125. Railway bonds are moderately active. State bonds are steady.

Money was again easier and lenders on time were more liberal in their offerings. Quotations were 4 @ 4½ % for 30 to 60 days and 5 @ 5½ % for three to five months on good collateral. Commercial paper was in pretty general demand and there was a comparatively large amount of ordinary paper offering, which was negotiated at about 6 @ 6½ %. The bank statement showed a gain of \$2,490,300 in cash and of \$2,467,000 in surplus reserve, making this item \$9,452,150. Loans contracted \$2,640,000. Chicago papers notice since the beginning of the month a decided decrease in the volume of mercantile and manufacturing notes offered to private bankers making a specialty of that traffic. Not the least difficulty is experienced in making sales of paper to either city or country banks.

The posted rates for bankers' sterling are \$4.81 @ \$4.81½. The London Economist refers to financial troubles in Germany and St. Petersburg, as well as to a possible more energetic demand from the United States as promising dearer money.

General business has somewhat improved, owing to easier money and the disposition in forwarding goods to anticipate the close of navigation. The low price of manufactured cottons and possible stoppage of Eastern mills on account of low water had some influence. Coffee received a stimulus in advices from Brazil, and made quite a gain in value. The prices touched by cotton are said to be the lowest ever recorded. The reports of the oil pipe lines for October show average daily runs of 118,000 barrels—the highest ever reached. The stock now in store above ground is 12,930,475 barrels. Among dry goods jobbers a prominent feature was a great auction sale of carpets by order of Alexander Smith & Sons Mfg. Company, comprising \$2,500,000 worth of goods. Prices were remarkably well sustained. The Yellow Pine Lumber Company were organized in New York, with a capital stock of \$2,500,000. They have purchased half a dozen yards and turned in their entire stocks of merchandise, saw mills, barges and other equipment at prices appraised by disinterested parties. Charles K. Buckley was elected president. Exports of merchandise from New York for the week \$9,594,000.

The American Bankers' Association at the final session, 12th inst., elected Richard M. Nelson of Selma, Ala., president, and ex-Controller John Jay Knox vice-president.

Toronto papers speak of many vacant houses in that city, owing to removals to the United States. Toronto and Montreal have been the chief points of attraction for several years for new settlers.

## Metal Market.

**Copper.**—Consumers have purchased a number of small lots of Lake Superior Ingot, for delivery during the balance of the year, at 11½¢ @ 11½¢. The transactions reported involve a total of 500,000 to 600,000 lb. No inclination to anticipate future wants is manifested, and the leading producers pretend to be indifferent, claiming that a large portion of the present and near future output is under the control of orders. The fact remains, however, that more than enough Copper to go around comes out from some source or other, and the competition of the smaller companies and speculative holders is met even by the apparently strongest concerns when it comes to matters of actual business. Inquiries for Wire Bars and Cakes have been more numerous and bids of 11½¢ for fairly large-sized parcels were refused. For casting brands the nominal prices are 10½¢ @ 11¢. There has been very little business in that class of metal, however, and the prices named are "nominal" in the fullest meaning of the term. The following comparative statement of exports of Copper during the nine months ending September 30 is from the monthly report of the Bureau of Statistics:

Ore.	1891.	1890.
	Tons.	Tons.
To United Kingdom.....	30,077	16,044
Germany.....	2,064	819
Other Europe.....	216	1
Total.....	32,357	16,864

Ingots, Bars and Old.	Pounds.	Pounds.
	1891.	1890.
To United Kingdom.....	13,673,394	1,086,611
Germany.....	4,879,907	219,295
France.....	21,857,079	4,728,631
Other Europe.....	15,723,105	1,600,452
Other countries.....	164,728	139,322
Total.....	56,232,213	7,834,311

**Pig Tin.**—Responding to a rise in London, prices here have advanced during the week to the extent of about ¼¢, sales having been made as high as 20.15¢, net cash, for prompt and all this month delivery. Holders of "puts" have covered some of their contracts and completed deliveries. There are still more or less of these obligations out, but whether they play any part in swaying values is not certain. London fluctuations seem to be the controlling influence at the moment, and, as the movements are no easier of explanation than usual, local speculators operate very cautiously. Purchases by city and out-of-town jobbers are on strictly conservative lines, and consumers are taking only such supplies as they may need to tide over immediate wants. Light shipments from the Straits during the first half of the month had a certain measure of influence for a time, but the willingness of holders of stock afloat and on the spot to sell, offset the light shipments at the present time. On Wednesday 19.90¢, net cash was paid for November and December delivery, and 19½¢ for a round lot, ex-ship. Five-ton lots out of store were quoted at 20¢ regular, and for jobbing quantities 20.10¢ @ 20.20¢ was asked by jobbers.

**Pig Lead.**—During the early portion of the week under review a few carloads were sold at 4.10¢, but the appearance of a little improvement in the demand caused smelters to suddenly change their position and the price was marked up to 4.15¢, at which 100 tons or more were disposed of. At that a very fair inquiry prevailed and sellers withdrew to await the outcome, meanwhile putting the nominal price at 4.25¢. Bids were subsequently made of as high as 4.30¢ for large lots and about 3000 tons were taken at that price, while 4.32½¢ was paid for single carloads. The market closed strong, with 4.35¢ asked.

**Spelter.**—No improvement in the demand from any source is visible. Smelters seem less inclined to urge sales, now that Pig Lead prices have had a smart advance, but the market is a weak one to sell upon, nevertheless, Western brands being taken indifferently at 4.85¢ in carload lots for prompt delivery and 4.80¢ for early shipments. Spot stock is quoted at 4.90¢ @ 4.95¢, according to the brand and size of lot.

**Antimony.**—Prices have advanced sharply in the foreign market, and holders of spot stock have marked their prices up to correspond. Hallett's is quoted at 12¢ @ 12½¢, LX at 12½¢ @ 13¢ and Cookson's at 15½¢ @ 16¢, in wholesale quantities.

**Tin Plate.**—More or less modification of prices in the foreign market has brought prices there very close to a parity with those ruling on this side of the Atlantic, and a better assortment of Plates is now offering. Purchases of future deliveries are on a limited scale, however, despite the more tempting offers made by sellers, and the spot trade is barely up to the average for this season of the year. Sellers' figures for several lines of Plates are modified a little, but the revised figures are full high. Close buyers taking round lots could probably secure a special favor in the shape of a concession of 5¢ per box. We quote: Coke Tins—Penlan grade, IC, 14 x 20, \$5.25; J. B. grade, do., \$5.35; Bessemer do., \$5.30; Siemens Steel, \$5.45. Stamping Plates—Bessemer Steel, Coke finish, IC basis, \$5.75; Siemens Steel, IC basis, \$5.85 @ \$6; IX basis, \$6.85 @ \$7. IC Charcoals—Melyn grade, \$6.50; for each additional X add \$1.50; Allaway grade, \$5.85; Grange grade, \$5.90 @ \$5.95; for each additional X add \$1. Charcoal Terns—Worcester, 14 x 20, \$5.75; do., 20 x 28, scarce; M. F., 14 x 20, \$7.45; do., 20 x 28, \$15.12½; Dean, 14 x 20, scarce; do., 20 x 28, \$10.70; D. R. D. grade, 14 x 20, \$5.30; do., 20 x 28, \$10.10; Mansel, 14 x 20, \$5.50; do., 20 x 28, \$10.40; Alyn, 14 x 20, \$5.50; do., 20 x 28, \$10.60; Dyffryn, 14 x 20, scarce; do., 20 x 28, \$11.20. Wasters—S. T. P. grade, 14 x 20, \$5; do., 20 x 28, \$9.85; Abercarne grade, 14 x 20, \$4.90; do., 20 x 28, \$9.70.

### New York Metal Exchange.

The following sales are reported:

THURSDAY, November 12.

25 tons Tin, November..... 20.00¢  
50 tons Tin, November..... 20.05¢  
10 tons Tin, December..... 20.00¢  
25 tons Tin, shipment from the East at £95. 5/  
c. i. f., N. Y.

FRIDAY, November 13.

25 tons Tin, November..... 20.15¢  
(One day notice.)  
25 tons Tin, November..... 20.07½¢

SATURDAY, November 14.

20 tons Tin, November..... 20.05¢

## British Iron and Metal Markets.

[Special Cable Dispatch to The Iron Age.]

LONDON, WEDNESDAY, November 18, 1891.

The situation in the Pig Iron market is without decided change. Hematite warrants are receiving more attention, but Scotch and Cleveland are traded in very indifferently, and the demand for makers' brands drags wearily, although favorable reports as to sales of several descriptions of Finished Iron are still given. Stocks in warrant stores include 499,000 tons Scotch and 149,000 tons Cleveland. Latest sales of warrants were at 47/ for Scotch, 38/4½ @ 38/6 for Cleveland and 48/4 for Hematite.

Liberal buying, in part for speculative account, caused an advance of 30/ in the

price of Pig Tin, prompt delivery selling at £91. 12/6. At the advance the demand slackened, however, and in the absence of support from previous conspicuous buyers prices receded 5/ @ 7/6 from the highest point, despite the announcement that shipments from the Straits during the first half of the month were only 599 tons.

Copper prices have fluctuated within narrow limits, and the market is steadier. There is now very little pressure to sell and lower prices are attracting fresh purchases for speculative account and for consumption. European spot stocks have increased 1917 tons and the visible supply 800 tons during the past fortnight. Chili charters during the first half of the month were 950 tons.

The Tin Plate market remains quiet and no improvement is looked for until American stocks show signs of more rapid depletion. Prices are rather weak and unsettled.

**Scotch Pig Iron.**—The business in makers' brands is no livelier and prices still lean more or less in buyers' favor:

No. 1 Coltness, f.o.b. Glasgow.....	57/
No. 1 Summerlee, " ".....	56/3
No. 1 Gartsherrie, " ".....	56/3
No. 1 Langloan, " ".....	57/
No. 1 Carnbroe, " ".....	48/6
No. 1 Shotts, " at Leith.....	58/6
No. 1 Glengarnock, " Ardrossan.....	57/3
No. 1 Dalmellington, " ".....	50/
No. 1 Eglinton, " ".....	50/

Steamer freights, Glasgow to New York, 2/; Liverpool to New York, 10/.

**Cleveland Pig.**—Business is moderate, but makers' prices are held quite steady at 38/6 @ 38/9 for No. 3 Middlesborough, f.o.b.

**Bessemer Pig.**—There has been a fair business and prices have changed but little. Makers quote 49/6 for West Coast brands, Nos. 1, 2 and 3, f.o.b. shipping port.

**Spiegeleisen.**—Dealings are still on a moderate scale, and prices are barely steady. English 20% quoted at 82/6 @ 85/, f.o.b. shipping port.

**Steel Rails.**—No change in the market. Demand still running light. Heavy sections quoted £4. 2/6 and light sections £5 @ £5. 10/, f.o.b. at N. W. England shipping point.

**Steel Blooms.**—The demand continues slow and prices are nominal. Makers quote £4 for 7 x 7, f.o.b. at N. W. England shipping point.

**Steel Billets.**—No improvement in the demand and former prices asked. Bessemer, 2½ x 2½ inches, quoted at £4. 5/, f.o.b. at N. W. England shipping point.

**Steel Slabs.**—Market remains very quiet. Bessemer quoted at £4. 5/, f.o.b. at N. W. England shipping point.

**Old Iron Rails.**—Situation the same as last week. Dealings moderate. Tees quoted at £3 @ £3. 2/6 and Double Heads £3. 2/6 @ £3. 5/, f.o.b.

**Scrap Iron.**—Prices are steady but the market is quiet. Heavy Wrought Iron quoted at £2. 10/ @ £2. 12/6, f.o.b.

**Crop Ends.**—Business moderate at old prices. Bessemer quoted at £2. 12/6 @ £2. 15/, f.o.b.

**Tin Plate.**—The market continues slow and rather weak. We quote, f.o.b. Liverpool:

IC Charcoal, Alloway grade.....	15/ @ 15/6
IC Bessemer Steel, Coke finish.....	13/3 @ 13/6
IC Siemens.....	13/6 @ 13/9
IC Coke, B. V. grade.....	12/9 @ 13/
Charcoal Terns, Dean grade.....	12/6 @ 12/9

**Manufactured Iron.**—Although not as brisk as last week, business has been fair and prices are steady. We quote, f.o.b. Liverpool:

Staff, Marked Bars.....	£ s. d.	£ s. d.
Common.....	6 15 0	6 17 6
Staff, Bl'k Sheet, singles.....	7 15 0	7 17 6
Welsh Bars (f.o.b. Wales).....	5 10 0	5 12 6

**Pig Tin.**—Market closes dull and prices are irregular. Straits quoted at £91 @ £91. 6/, spot, and £91. 13/6 @ £91. 15/ for three months' futures.

# HARDWARE.

## Condition of Trade.

THE SPECIAL REPORTS herewith given will be read with interest for the information they contain in regard to the state of trade in the Hardware centers to which they relate. It will be observed that while, as a rule, a cheerful view is taken of the future prospects for business, the present volume of trade is not referred to as especially heavy. The causes which tend to produce this condition of things are in some cases referred to by our correspondents, who also touch upon the special features of their markets. It is evident that trade is much better in some sections than in others, some of the markets being characterized by a gratifying activity and others being comparatively quiet. At the present time Southern business is perhaps the most unsatisfactory, owing in large measure to the low prices of cotton, and trade in the States most affected by this report a very moderate demand. Travelers from many different sections give advices of what is regarded as an increasing conservatism on the part of retailers, who are referred to as purchasing only to meet their early needs, carefully avoiding accumulation of stocks and overpurchasing, and in many cases keeping their stocks down as small as they can. This is obviously a policy which has its effect in reducing the present volume of trade, but promises well for future business, inasmuch as there is a constant and enormous consumption of goods, and when a more active demand sets in the moderate stocks of dealers will call for liberal purchases. The exceptionally fine weather which has generally prevailed for the past few weeks has had an influence in repressing business in miscellaneous as well as in seasonable goods, and with the coming of colder weather a more vigorous demand in many lines may be anticipated. Collections are probably in better condition than they have been for some time, but money is not moving in trade channels as freely as might be desired.

### Chicago.

(By Telegraph.)

The demand for Shelf Hardware is running about as it did last month, with no special change in any respect. Staple goods are called for in only a moderate way. The severe cold snap of this week, which is the first real foretaste of winter, will undoubtedly stimulate the demand for seasonable goods. Irregularity is re-

ported in Wood Screws, which are being used by some dealers to move other goods. The regular discount is 7½ and 10 per cent., but an additional 10 per cent. has been given quite freely the past week or two, and the demoralization has become sufficiently serious to engage the attention of manufacturers, who see in it a menace to their own prices, which have so far been very firmly held. Heavy Hardware is gaining again, after a falling off early in the month. Monday of this week was a particularly heavy day in every way. The grain States of the West have lately been buying supplies very freely, while the mining States have been comparatively quiet. Collections are steadily improving.

### St. Louis.

(By Telegraph.)

The Hardware trade during the past week has been satisfactory. Trade in the West and Northwest is increasing, and the Southern trade is keeping up fairly well. The cold snap which set in a few days since has stimulated trade in many respects. In Fire Arms and Ammunition the demand is very heavy. Shelf Hardware is moving in good shape, but heavy Hardware is spasmodic, one day being a busy one, the next bringing little or no demand. Prices are well maintained in nearly all staple lines. Builders' Hardware is dull, and Wire and Cut Nails are in the same condition. The general outlook is encouraging, and the only drawback is some complaint from Southern points in regard to collections.

### St. Paul.

FARWELL, OZMUN, KIRK & Co.—Trade during the last two weeks has run along in just about the same channel as during the preceding 60 days, being steady and without any considerable increase. Retail trade is taking a very conservative course, and buying only for actual wants in the early future, except to some extent in Wire and Nails, in which some sales are being made for the spring trade. The weather has been favorable up to the 10th inst. for fall plowing and for the stacking and threshing of the crops of this abundant year. Farmers have been too busy to need much Hardware beyond the usual current wants. We are now too near winter for there to be any special rush in Hardware, and Jobbers will be obliged to defer their realization of the profits of the large crop, so far as sales are concerned, until next spring. It is also unfortunate that so large a part of the fall plowing cannot be done, thus throwing additional work into next spring, with the added disadvantage of spring plowing being not so favorable for the crop as is plowing in the fall. Collections have been slower than expected, owing to the above causes, but the country is, generally, in a healthy condition, and when the crops are marketed during

the winter and next spring there will be considerably more than the usual amount of money in circulation, and it is confidently expected that trade and collections will both be satisfactory. Prices are fairly maintained in nearly all lines of Hardware, and we think there is not so general a complaint of cutting prices among jobbers as usual. This desirable condition of the trade has existed throughout the whole year, and we believe that on the whole jobbers have realized a better rate of profit than has been the case before for some years past.

### Portland, Ore.

FOSTER & ROBERTSON.—For more than a month past we have had almost constant rains, and as a natural consequence trade has been considerably affected, showing a measure of decrease during the month of October and so far into this month. This in face of the general expectation that fall business would show a material increase. The constant rains have made the country roads west of the Cascade Mountains almost impassable, so it is about impossible for the farmer to get into market with his produce or the merchant to get out and make collections. Thus we have, coupled with a moderate trade, decidedly light remittances, compared with what we had every reason to expect. The improvement in the Lumber trade, which seemed so promising some two months ago, has not materialized, so that business in the Sound country is still in a very unsatisfactory condition, although there have been comparatively few failures where many were expected. Prices still continue steady, with no changes to report, although there is considerable tendency to cut figures in a quiet way.

### Cleveland.

THE W. BINGHAM COMPANY.—The unusually bright and summer-like weather that we have experienced so far this fall has somewhat retarded trade in all branches and Hardware has suffered with the rest, although not to the extent that some others have. November has opened up very favorably as compared with October and with a year ago, but without anything to note in the way of a change in prices. The demand for Barbed Wire is nominal, at rates as established by the Columbia Patent Company. Wire Nails are selling freely at the present low prices. Cut Nails are but little called for. Tin Plate, especially for roofing purposes, is in good demand, and prices are firm. American Plates are making their appearance in this market in limited quantities. Holiday goods such as Hardware dealers handle are being inquired for, and on almost every traveler's orders is something in this line. City retailers report trade as improving, Builders' Hardware being especially mentioned. The building records for October show an in-

crease of buildings erected in this city for the month of October, as compared with the corresponding month for the past three years, of an average of over 15 per cent. Collections are only fair.

#### Philadelphia.

**SUPPLEE HARDWARE COMPANY.**—In making up our present report we fear that we have little that is of change to note since our last letter, as the general conditions of trade with us are practically in the same state that they were both two and four weeks ago; while from some sections we have noted an inclination to be less conservative in making purchases, we find in other territory a prevailing disposition to hold orders down to actual needs only, which has made trade, as stated, about on an average with what we have been favored with. The holding back of crops and products by the farmers in most sections has had the tendency to make our collections slow; an improvement, however, we are pleased to report within the last few days.

#### Boston.

**BIGELOW & DOWSE.**—There is a marked improvement ever last month in the volume of business as well as in remittances. There is no speculative buying, but there is more confidence in the stability of present prices. Although Manila Cordage has been advanced nearly 2 cents per pound it sells readily at the advanced prices. The trade think more of the manufacturer who advances his prices, which insure them a profit, than they do of him who reduces values. There is a much better feeling among the outside makers of Screws and several have advanced prices nearly 10 per cent. Later on this should increase the selling price in this market, which has been very much demoralized of late. Inquiries for carload lots of Steel and Wire Nails are more frequent, which demonstrates the fact that the trade are carefully watching the market. With an abundance of money in our banks and confidence established the future prospects are very encouraging.

#### Omaha.

**LEE, CLARKE, ANDRESEN HARDWARE COMPANY.**—In its general features this market presents no changes worthy of note. There is a constant, steady demand for goods both from the agricultural and mining districts which aggregates a very respectable volume, so that jobbers are well satisfied with present conditions and future prospects. The large crops of this year, for which there is an assured market at good prices, will bring to this section millions of dollars. This will enable the farmers to pay off a considerable part of their mortgage indebtedness, and to make needed or desirable improvements which a period of depression compelled them to forego. A new impulse will be given to emigration from the Eastern and Middle States to those of the West, and the larger demand for agricultural lands will increase their market value. The great mining districts of the West will probably experience greater activity, and their enlarged

output will add materially to the general prosperity. Under the stimulus of greatly enlarged markets for our products the industry of cattle and hog raising must of necessity expand, and this already large resource of the West will contribute more largely than ever before to the resources of Western producers. Notwithstanding the enhanced prices of feed of all kinds, and the re-opening of European countries for our meat products, which is only natural to suppose would stimulate the market and advance prices somewhat, it is strange to note that market prices for cattle and hogs rule abnormally low, and it is claimed by producers that at present price of feed no margin whatever is left for the stock raiser. A change is looked for in this respect, and from the statistical position of these "goods" it is expected that the market must change in sellers' favor before very long.

#### Baltimore.

**CARLIN & FULTON.**—The conditions of trade in this section are about the same as at the time of our last report, some days being characterized by feverish activity, followed by others of an intermitting dullness. Cold weather would stimulate orders, but with the ethereal mildness which has prevailed the demand for seasonable goods is not as active as we would like it. The reports we receive from the South vary according to the section and the humor of the correspondent, for while one writes that the unsatisfactory price of cotton is somewhat compensated for by an immense crop of corn, another writes that the situation has no redeeming feature at all. It comes within our own observation that never have the railroads throughout the entire country been so blocked with freight moving to the seaboard as at the present time, and in spite of all the prophecies to the contrary, we cannot but believe that the money returning from these immense crops must, in a very little while, cause a brisk revival of business everywhere. With the fall elections over, another distracting feature has been removed, for the discussion and excitement attending political campaigns interfere with business to an extent far greater than is generally supposed; and right at this point it may not be inappropriate to suggest that when the State legislatures meet this winter it would be of incalculable benefit to the entire country if some system could be devised for the improvement of country roads which would prevent the paralysis of trade following every thaw during the winter and spring through the inability of the farmer to haul and market his produce. The importance of good roads cannot be overestimated and is a matter which concerns not merely the agricultural, but the mercantile interests in general.

#### Louisville.

**W. B. BELKNAP & Co.**—The most encouraging features in the state of trade is the undisputed fact that the consumption is on a strictly legitimate basis—that is, there is not a pound of Iron or a single gross of Screws being bought, but what is

actually required for work in hand. Low as the price is there is no desire manifest in any quarter to stock up liberally, but on the contrary orders are still pared down to scantiest proportions. All efforts to advance prices except where close combinations have been made have failed, and even combinations do not always succeed in bringing this about. Meanwhile it must be apparent to the most casual observer that business is growing healthier and healthier as time goes on. We must come to a time when the magnificent crops are once realized on and the long era of saving and economy that we have been going through shall begin to tell. The number of failures continues uncomfortably large and in the South particularly money is close and recuperation seem impossible to effect. This is due largely to the fact that the boom enterprises of various localities have not been sustained. Immigration in this direction is still very light, hence the great land schemes have lacked the support that they get in the West and North. Again, the price of cotton is low and that is always a depressing influence. Singularly enough, it is claimed now that the quality is over fine, that it will prevent the mills from using it to best advantage. Locally the lumber business, which was greatly overdone in the past few years, has suffered a severe collapse. Quite a number of failures, some large and some small, have succeeded each other in rapid succession here, as well as some destructive fires, both in city and country. We hope, however, to get things well cleaned up by the new year and start out auspiciously for '92.

### Notes on Prices.

**Cut Nails.**—Prices in the East continue on a basis of \$1.50 in carload lots at mill for either Iron or Steel, and in the West the price remains slightly higher, \$1.50 to \$1.55 for round lots at mill on a 30-cent average, with concessions, however, from those figures. The tone of the market is substantially the same as at our last report, some manufacturers not caring to press sales at present prices, but enough of them are ready to furnish Nails at current rates to enable the trade to have all they desire at existing quotations. Parties who are expecting to purchase Nails within the next month or two should watch the market closely, and consider the question as to the advisability of making their purchases before long.

**Chicago, by Telegraph.**—The Steel Cut-Nail trade is fairly alive. Local mills are well supplied with orders for the month and hold prices firmly at \$1.65 on 30¢ average. By a typographical error last week the factory price Chicago was given as \$1.75 instead of \$1.65. The Wheeling makers are getting a fresh foothold in this market on special offers, but their sales thus far have been mainly confined to the carload trade. Jobbers quote \$1.75 from stock.

**Wire Nails.**—While some of the mills are showing a disposition to withdraw extreme quotations, Wire Nails can still be procured at \$1.70 @ \$1.75 in round lots at

mill. The volume of business during the past week has been large, many of the trade being evidently under the impression that it is safer to purchase now than to wait longer, with a possibility of a recovery in the market, owing either to an improvement in prices in the raw material or to concerted action among the manufacturers for the regulation of production. Small lots from store are quoted regularly at \$2 @ \$2.10.

*Chicago, by Telegraph.*—Manufacturers of Wire Nails report a moderate business the past week, which keeps the factories well employed. In connection with old contracts the trade has improved to such an extent that \$1.75 at mill is now being obtained by the leading makers. Jobbers' prices from stock range from \$1.95 to \$2.05, according to the character of the order.

**Barb Wire.**—The market continues without special feature, but with a somewhat increased demand. The trade are, however, purchasing cautiously, being influenced somewhat by an impression which has obtained currency that the Columbia Patent Company do not find their course at plain sailing as they hoped, but while rumors to this effect have been prevalent we are unable to verify them. The trade, on the other hand, recognizes that an advance would not be unlikely with the assured control of the market by the company.

*Chicago, by Telegraph.*—The Columbia Patent Company report their business improving every day, and fast getting up to the proportions they desire. There seems to be an impression in the trade that prices will soon be advanced by the company, but thus far they have given no sign of such an intention; they are, however, in better position to do this now than at any former time, owing to a combination of circumstances through which outside competitors have been greatly reduced for at least some considerable time.

**Strap and T Hinges.**—For some time there has been, as the trade are aware, a feeling of more or less dissatisfaction on the part of the jobbers with the prices made by the manufacturers of Strap and T Hinges, whose price has been substantially the same to the wholesale and the retail trade. The point is made that this policy does not give the jobbers an opportunity of selling the goods at a sufficient profit. The manufacturers, on the other hand, have taken the position that if special prices were given to the wholesale trade it would be only to enable them to cut the price, the probability being that the goods would be sold by the jobbers at very nearly the figures paid by them. The manufacturers have also made the point that previous to the establishment of the present prices on the goods the jobbers had an opportunity to purchase freely at the very much lower prices then ruling, the result being that orders were placed at extremely low figures by which the jobbers were put in possession of stocks which have not even yet been entirely depleted. As the stocks

began to run low the jobbers have recently been urging upon the manufacturers the policy of arranging a scheme of prices by which there would be a margin for the large buyers which would enable them to realize a better profit on the goods. This question has accordingly received consideration from the manufacturers, and last week action was taken to meeting the jobbers' views. While no open announcement has been made of any change in policy or prices, it is understood that an opportunity will be given the jobbers to place their orders at a slight concession on prices which have been ruling. This is done with a view to enabling them to enter their orders and cover their needs for some time to come. It is also understood that there will be before long an advance in the price both to retailers and jobbers, with the adoption of quantity discounts which will favor the large buyers. While there is thus a slight concession in price for the time being this is not an indication of weakness, but of the adoption of a new policy by the manufacturers.

**Cordage.**—A further advance has been made by the National Cordage Company, who on Saturday advanced the price of Manila Rope  $\frac{1}{2}$  cent per pound, and Sisal and New Zealand 1 cent per pound. This action is taken in view of the fact that they are securing control of the market and outside competition ceases to be an important element. The tone of the market is decidedly strong and it is thought probable that further advances will follow. Most of the large buyers have, of course, placed their orders, and in many instances at the low prices which ruled previous to the first advance. At the present time orders are accepted by the company for immediate specification, shipments to be made at the earliest convenience of the factory. The following are the prices for large lots at factory, which are subject to the regular discount:

	Per pound.
Manila, $\frac{1}{8}$ inch and larger.....	10 $\frac{1}{2}$ ¢
Manila, $\frac{3}{8}$ inch.....	10 $\frac{1}{2}$ ¢
Manila, $\frac{1}{2}$ and 5-16 inch.....	11 $\frac{1}{2}$ ¢
Manila, Tarred Rope.....	9 $\frac{1}{2}$ ¢
Manila, Hay Rope.....	10 $\frac{1}{2}$ ¢
Sisal, $\frac{1}{8}$ inch and larger.....	7 $\frac{1}{2}$ ¢
Sisal, $\frac{3}{8}$ inch.....	7 $\frac{1}{2}$ ¢
Sisal, $\frac{1}{2}$ and 5-16 inch.....	8 $\frac{1}{2}$ ¢
Sisal, Hay Rope.....	7 $\frac{1}{2}$ ¢
Sisal, Tarred Rope.....	6 $\frac{1}{2}$ ¢
Sisal, Medium Lathe Yarn.....	5 $\frac{1}{2}$ ¢
New Zealand, $\frac{1}{8}$ inch and larger.....	6 $\frac{1}{2}$ ¢
New Zealand, $\frac{3}{8}$ inch.....	7 $\frac{1}{2}$ ¢
New Zealand, $\frac{1}{2}$ and 5-16 inch.....	7 $\frac{1}{2}$ ¢
New Zealand, Hay Rope.....	6 $\frac{1}{2}$ ¢
New Zealand, Tarred Rope.....	6 $\frac{1}{2}$ ¢

**Lead Pipe and Sheet Lead.**—Under date November 10, Bailey-Farrell Mfg. Company, Pittsburgh, Pa., announce the following prices for Lead Pipe and Sheet Lead, which are subject to the usual discount of 10 and 5 per cent.:

	Per pound.
Lead Pipe, in whole coils.....	\$0.05 $\frac{1}{2}$
Sheet Lead, in whole sheets.....	.06 $\frac{1}{2}$

**Zimmermann's Blind Fastener.**—The following price-list of Zimmermann's Steel Bar Blind Fastener or Adjuster, for whom W. H. Jacobus, 90 Chambers street, New York, is agent, is subject to a discount of 45 per cent.:

#### Japaned, per Dozen Sets.

Inches.....	9	10 $\frac{1}{2}$	12	14	16	18
	\$4.50	5.00	5.50	6.50	7.00	7.50

#### Galvanized, per Dozen Sets.

Inches.....	9	10 $\frac{1}{2}$	12	14	16	18
	\$6.00	6.50	7.00	7.75	8.50	9.00

**Glass.**—There is a disposition on the part of large buyers to defer placing orders for Window Glass. At this time of the year inquiries are expected by factories from large buyers regarding prices, which are followed by orders being placed for future delivery. These inquiries are not being received this year, which shows that lower prices are expected on the part of jobbers. The manufacturers claim that in consequence of the increased cost of fuel, together with the greater cost of the chemicals that are used in manufacturing Glass, there is no money for them at present prices, and that when the demand does come prices will probably be higher. While the number of factories that are not running is quite large, demand is not sufficient to avoid the accumulation of stock. Factories which for financial reasons are obliged to sell are making prices that will secure orders, while others are stocking their surplus. At the meeting of the Glass manufacturers, held at Cincinnati last week, the demand was not found active enough to warrant an advance in prices. No definite action was taken toward forming a trust. Quotations remain unchanged upon the following basis: American Window Glass, in carloads, 80 and 10 and 5 per cent. discount; less than car lots, 80 and 5 per cent. discount; French Window Glass, 75 and 10 per cent. discount; American Plate is held at a discount of 50, 10 and 5 per cent., and Imported Plate at a discount of 60 per cent.

### Export Trade.

**SOUTH AMERICAN** trade continues in an unsatisfactory and unsettled state. While an improvement is hoped for before long, the outlook is regarded as somewhat uncertain. It is thought doubtful whether there will be in the near future any important improvement in Argentine trade. Shippers are anxiously looking forward to the resumption of business and old-time prosperity, although little encouragement can be had from the present situation. In view of the unsettled condition of things in the Argentine Republic, it is thought probable that the worst has not yet been reached. The markets have apparently been heavily overloaded and little or no demand for goods exists. In Brazil the entire machinery of business has been upset to such an extent that trade is almost at a standstill, and it is thought that unless the internal troubles are soon adjusted business is likely to suffer more. The West Coast affairs are well understood by the general public, and as matters have now settled down and the war is over, it is thought that merchants will soon be in a position to place orders. Import shipments which have been held back are now beginning to go on.

The Australian colonies seem to be rather under a cloud just at present, al-

though favorable reports were received by last mail regarding New South Wales. She has succeeded in placing her loan of £4,500,000 in London, and this will result, undoubtedly, in giving quite an impetus to trade in a general way. Many large Government works have been in contemplation for some time, and plans will now probably be carried out for their completion.

Considerable interest is being manifested in Sydney in the World's Fair, and it is officially announced that application has been made by the Chamber of Commerce for representation on the commission appointed by the Government to arrange for exhibits. Quite a number of well-known travelers are on their way home from Australia after a long siege in that market, and several large buyers are reported in the country at the present time. Freight rates to Melbourne and Sydney are quoted at 9½ cents and 9 cents, and the indications are that they will be higher very soon. The only Melbourne vessel now in berth is the Raphael, which is being loaded by H. W. Peabody & Co. She closes on November 24, and we do not hear of any new charters for that port.

We have a letter from Polhemus Lyon, our foreign representative, who gives a full and very interesting account of the condition of things in South Africa, but the pressure on our space prevents us from giving it this week. It will appear in our next issue.

### Trade Items.

**A**N ATTRACTIVE advertising novelty comes to us from Chadborn & Coldwell Mfg. Company, Newburgh, N. Y. It consists of a cloth covered beveled base, upon which is attached a pencil pad, headed with their name. Over this a cover folds, bound in cloth, having the top almost covered with a sheet of celluloid. On the celluloid are illustrations of their new Model Lawn Mower and their Excelsior Horse Lawn Mower. At the side of the pad is a pencil holder, containing a sharpened pencil. The company express the hope that the pad may be of service to the recipient as well as to themselves, and offer to replace the printed pad, when the present one is exhausted.

ROUSE, HAZARD & Co. of Peoria, Ill., issue, under the title of "Job Lots," a very extensive list of Bicycles, which they offer for sale at or below wholesale figures. They state that these are brand new Bicycles. The firm make a specialty of buying job lots of new machines when they are of desirable patterns and the prices right. They also carry a large stock of second-hand Cycles of all makes.

IN THEIR ADVERTISEMENT on another page the Coldwell Lawn Mower Company, Newburgh, N. Y., notify the trade that their new plant, fitted with the latest and most improved machinery, is now in full operation and that they are prepared to place on the market a full line of Lawn Mowers for hand or horse power. The company refer to the valuable features of their machines and the long and comprehensive experience of their Mr. Coldwell, who has been granted many patents in connection with Lawn Mowers, and was for over 20 years president of the Chadborn & Coldwell Mfg. Company. They also announce that they will place on the

market the coming season, an improved Lawn and Scarifying Rake for cultivating lawns.

THE SUN NOVELTY WORKS of Greenfield, Ohio, are now manufacturing 14 different styles of Coffee Mills and a complete line of Sun Rat Traps, having added a number of new designs this year. In order to introduce the goods where they are not now sold the company are sending out what they term a Christmas box of samples, containing two dozen Mills and one dozen Traps, for \$8.50 net. They state that duplicate orders for lots of this sort are not accepted.

E. HAMILTON HUNT, formerly of Edwin Hunt's Sons and Machinists' Supply Company, Chicago, has purchased for himself and others the McCamly & Taylor Nail Company, Battle Creek, Mich., and reorganized the business as the Western Nail Company, Limited. Mr. Hunt is the general manager of the new concern.

UNDER DATE OF NOVEMBER 10, 1891, it is announced that the business of the Rhode Island Horse Shoe Company, Providence, R. I., will hereafter be carried on by the Rhode Island Perkins Horse Shoe Company, to whom remittances in settlement of accounts must be made. No change has been made in the management of the company.

### It is Reported—

That B. D. Hubers of Summerville, Ore., will soon open a Hardware and Tin store at Elgin, in that State.

That W. R. Frymire will engage in the Hardware business at Bromfield, Neb.

That Mr. Vaden of Vaden & Co., Hardware dealers, Manchester, Va., was recently married to Miss Lucy Nelson Sublett.

That Harley & Smith will soon engage in the Hardware business at Fall's Creek, Pa. They were formerly located in Burnside, Clarion County.

That Harrison P. Arnold is about to dispose of his Hardware store at Burlington Flats, N. Y., intending to locate himself in Montana.

That H. Russell & Co. have recently embarked in the Hardware line at Madison, Maine.

That the Hardware establishment of Belcher & Loomis, Providence, R. I., was burglarized on the 11th inst. A large quantity of goods was stolen.

That Savage Bros., Berkeley, Cal., dealers in Hardware, have dissolved.

That George W. Heck has sold out his Hardware business at Chicago, Ill.

That Voightlander & McManus have recently commenced the Hardware business at Hamilton, Ill.

That Anthony Miller, Lodi, Ill., recently sustained damage by fire.

That H. E. Maines has bought out the Hardware business of C. W. Folsom, Madison, Maine. Mr. Maines formerly managed the store.

That Reeve & Brines are a new Hardware firm at Rushville, Ill.

That J. S. Blackwell, dealer in Hardware, Gladstone, Mich., has disposed of his business to J. A. Bradley & Co., who will continue it at the old stand.

That C. J. & J. B. Smith's Hardware establishment at Minneapolis, Minn., was damaged by fire on the 7th inst. The loss is in the neighborhood of \$1500.

That J. Gebhard, Hardwareman, St. Clair, Minn., has removed to Lamberton.

That Rosenkranz & Thorn, Hardware merchants, at Rhinebeck, N. Y., have purchased a building in that place which will enable them to accommodate their enlarging business.

That James Wyckoff, dealer in Hardware, Raritan, N. J., has taken possession of his old quarters.

That Cole & Andrus' Hardware store at Buffalo, N. Y., was robbed on the 5th inst. A large stock of Cutlery, Pistols and Ammunition was taken.

That in a fire at St. Charles, Minn., the stores of Walter M. Ross and S. C. McElhaney, dealers in Implements, were damaged.

That J. J. Amon has begun the Hardware business at Perrysburg, Ohio.

That J. L. Holmes, Hardwareman, Durhamville, Tenn., has removed to Ripley.

That Moore & Pierce are a new Hardware concern at Monticello, Wis.

That the Hardware store of S. L. McKay at Kingsville, Ont., was destroyed by fire on the 2d inst.

That Wilcox & Flett, Hardware dealers at Neche, N. D., will retire from business January 1.

That Joseph Ehart & Son's Hardware store at Fort Madison, Iowa, was burglarized on the 30th ult., and \$75 worth of goods taken.

That A. J. Roy and his brother, E. Roy, are thinking of entering the Hardware business at Kankakee, Ill.

That V. Batz, Hardwareman, St. Cloud, Minn., has disposed of his business, the sale to take effect January 1.

That Rivord & Johnson have succeeded J. B. Rivord & Son in the Hardware business at Austin, Minn.

That Charles G. Hartshorn has entered the Hardware business at Clarion, Iowa.

That H. M. Holmes is a new Hardwareman at Cedar Springs, Mich., having acquired the business of H. B. Wagar.

That Metcalf Bros. have recently entered the Implement business at Free-land, Mich.

That C. B. Pittman & Co., Pontiac, Mich., have sold out their business.

That Burget & Lewis, Hardware dealers, Great Barrington, Mass., are erecting a three-story block, part of which when completed will be occupied by their business.

That E. B. Gaylord is closing out his Hardware stock at Shelby, Mich.

That Spring & Johnson have disposed of their Hardware business at Pawnee City, Neb.

That Benoit & Sylvester, Hardware dealers at Crookston, Minn., have been succeeded by Sylvester & Finseth.

That R. J. Bennett, Hardware, Seattle, Wash., is about to move to Portland.

That the Hardware establishment of Beeghley & Welsh at Dayton, Ohio, was robbed, for the second time within a few months, on the 4th inst.

That Washburn's Hardware store, at Orange, Mass., was burned out on the 7th inst.

That the store of Geo. E. Teele, Watertown, Mass., was damaged by fire on the 5th inst. His Hardware stock was injured to the extent of \$3000, fully covered by insurance.

That A. H. Totman, Hardwareman, Fairfield, Maine, was robbed on the 5th inst. The goods stolen are valued at \$100.

That M. W. Upton has commenced the Hardware business at Camden, Maine.

That the Jackson Hardware and Implement Company at Durango, Col., will erect a new store to cost \$10,000.

That Crane & Co., Hardware dealers at Colorado City, Col., have sold out their business.

## Multiple Index Hardware Price Book.\*

**A**NOTHER PRICE BOOK has been added to the series issued by *The Iron Age* for the use of Hardwaremen. It is designated as Multiple Index, and is represented in the accompanying illustration, which indicates its arrangement and some of its special features. The book itself is larger than any of the others of the series, its size being 7 x 10 inches. It is bound in flexible seal grain leather in the strongest and most substantial manner, the object being to furnish a book as well made in every respect as possible, in order that it may stand the long and continuous usage to which such a book is subjected. The paper is Crane's heavy ledger paper, which is tough and strong and of a quality to make it well adapted to its purpose, and permitting frequent erasures if necessary. The book contains 280 pages, thus giving space for recording quotations on a complete line of Hardware and related goods. The ruling and ar-

ferent parts of price books, which is so serious an objection to their use.

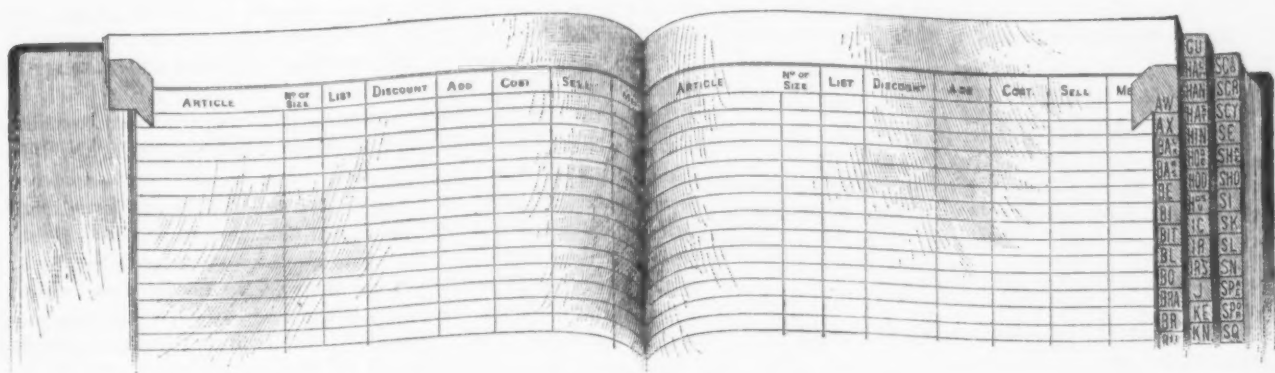
Another special feature is the arrangement of the index characters, which instead of being alphabetical are arranged with special reference to the classification of Hardware goods, each index character giving the first two or three letters of the names of Hardware articles. This feature of the book and its convenience will be best apprehended by an examination of the following specimen of the indexing, which is a *fac-simile* of that used in the book and shows the three parallel rows of index characters:

AD	CU	SC <sup>o</sup>
AN	HA <sup>L</sup>	SCR
AU	HAN	SCY
AW	HA <sup>S</sup>	SE
AX	HIN	SH <sup>E</sup>
BA <sup>N</sup>	HO <sup>E</sup>	SHO

The ease and convenience with which

pains have been taken to make the arrangement satisfactory in this respect, and it is offered with confidence that it is comprehensive and nearly, if not entirely, complete. It is, however, obvious if any articles are not directly designated by the index characters, that the index being alphabetical in its arrangement would indicate the place where quotations on such articles should be recorded. The supplement, however, which consists of 40 pages in the end of the book, may be found useful for quotations on any outside goods which the Hardwareman may desire to keep prices on, while at the same time it may be used if necessary for any overflow of matter from the preceding pages, or to contain list prices or other matter relating to goods. It is not, however, thought that it will be necessary to use the supplement for regular Hardware articles, as the provision made for them in the index portion of the book appears to be ample.

*Hardware Classification.*—A pamphlet containing a classification of the leading Hardware articles is furnished with the



*The Iron Age Multiple Index Hardware Price Book.*

range of the pages are shown in the illustration, this form being adopted as the best and most convenient, permitting a systematic recording of prices, provision being thus made in the different columns for the name of the article, the number or size, the list price, the discount, freight or other expenses, the total cost, selling price and any memoranda which it may be desirable to enter. It is, however, obvious that if any buyer should prefer to follow some other method of marking prices than that thus indicated, the different columns may be devoted to such use as may be considered desirable.

*Multiple Index.*—The special feature of the book is the method of indexing employed in it, which is designated by the term Multiple Index. By means of the three parallel rows of indexing which run through the entire book (except the supplement) the person using it can by a *single motion* turn to any of the 238 pages, thus reducing to a minimum the labor and time usually employed in referring to the dif-

ferent parts of price books, which is so serious an objection to their use.

For Augers,	turn to	AU
" Apple Parers,	"	PA
" Saws,	"	SAW
" Pumps,	"	PUL <sup>M</sup>
" Bits,	"	BIT
" Chisels,	"	CHI
" Cutlery,	"	CU
" Cartridges,	"	CAR
" Rules,	"	RU
" Locks,	"	LO
" Iron,	"	IR
" Irons,	"	IR'S
" Shovels,	"	SHO
" Grindstones,	"	GRI
" Stones,	"	STO

Special care has been taken to make the classification as indicated in the index correct and comprehensive, making provision for all Hardware articles and giving to the different kinds sufficient space for the keeping and recording of prices. So satisfactory has been the result that it is thought that every strictly Hardware article has its first two or three letters given, thus permitting immediate reference to it by a single motion. Special

price book. This pamphlet is arranged in such a way as to indicate at a glance the most desirable place for recording the prices of the different goods. The classification agrees with that followed in the price book, in which as a general rule articles having a double name, such as Auger Bits or Apple Parers, are indexed by their last name—that is, Auger Bits under Bits and Apple Parers under Parers. The pamphlet giving the classification is, in fact, an expansion of the index of the price book, and is given in order to facilitate its use. After a little familiarity, however, with the price book the Hardwareman will be able to dispense with it entirely, as the index indicates with sufficient clearness the place where prices on the different articles are to be recorded.

*Standard Lists.*—In connection with this price book a set of *The Iron Age* STANDARD HARDWARE LISTS, described on another page, can be used with great advantage. This pamphlet, as explained elsewhere, is a collection of standard Hardware lists printed on thin paper of fine quality, and so arranged as to give the list in the most compact and convenient form for reference. These lists, which are printed on only one side of the paper, are intended to be cut out and

\* *The Iron Age* Hardware Price Book E, with Multiple Index; 7 x 10 inches, 280 pages, flexible seal grain leather, with pocket; Crane's heavy ledger paper; price \$5. Published by David Williams, 96-102 Reade street, New York.

placed in price books in such a manner as may in each case be best. By the use of these lists, all of which may be inserted in one of these price books without the slightest injury to the book or inconvenience in its use, the buyer has before him in the most condensed form the list prices on a large variety of leading goods.

This price book, which has been prepared by R. R. Williams, Hardware editor of *The Iron Age*, is presented to the attention of Hardwaremen in the confidence that it will be found a most valuable aid in keeping track of prices. It is hoped that it will materially lessen the labors of those who are already doing this carefully and systematically, and that it will offer to others who have found the matter under the old methods attended with too much difficulty a price book which will enable them with the least possible labor to record the prices of the large variety of goods which enter into a Hardware stock.

### The Iron Age Standard Hardware Lists.\*

IN CONNECTION with the use of price books the matter of list prices usually presents some difficulty to the Hardwareman. There are certain objections to having

edited and arranged by the Hardware Editor. In this compilation of standard lists the aim has been to give the leading lists in as clear and compact an arrangement as possible, so as to permit their being advantageously cut out and inserted in the price

#### Sauce Pans and Round Boilers.

Pints.	Plain.	Turned.	Tin'd or En'd.
1	\$0.30	.35	.39
1½	.32	.37	.44
2	.35	.39	.48
3	.42	.47	.56
Quarts.			
2	.50	.56	.63
2½	.53	.59	.68
3	.55	.62	.73
4	.60	.68	.84
5	.65	.75	.96
6	.70	.81	1.11
7	.75	.84	1.21
Gallons.			
2	.85	.96	1.31
2½	1.05	1.18	1.56
3	1.30	1.35	1.70

were found to be very correct.

The success of the effort to give the lists in small space is illustrated in many of the lists, in which a clear and condensed arrangement is secured. For instance, the

Wrench list occupies but 3 inches by ¼ inch, Fig. 1, while the list of Stove Hollow Ware, as reproduced in Fig. 2 in very small space, gives the list prices on a large and important line of goods which often occupy several pages in catalogues. In

Strap and T Hinges, and Butts, Figs. 3 and 4, it will be observed that a new arrangement is adopted, which is regarded as presenting these lists in a very convenient as well as condensed form.

Maslin Kettles, Glue Pots, and Sauce Pans and Round Boilers are

#### Glue Pots.

No.	4/0	3/0	2/0	0	1	Tinned or Enameled.
No. 2	\$4.50	5.00	5.50	6.00	6.75	\$8.40
No. 3						10.26
No. 4						12.42
No. 5						14.58
No. 6						16.94

represented in lists which can be used

different forms and sizes so that the Hardwareman can select the form or size which in his judgment is best adapted to his price book and his method of recording prices.

As further illustrations of the way in which these lists are arranged we reproduce the Wire Nail card in one method of arrangement, Fig. 5, and also Brass Shells, Fig. 6. In the Tack list an arrangement

#### Brass Shells.

##### First Quality.

Gauge.	Length.	Per 100
8	3 in. or under..	\$18.00
8	over 3 in.....	20.00
10	2½ in. or under	10.00
10	over 2½ in....	10.50
12	2½ in. or under	10.00
12	over 2½ in....	10.50
14	2½ in.....	10.00
16	2½ in.....	10.00

##### Second Quality.

10	all lengths.....	8.00
12	" " " " " " " "	8.00

Fig. 6.—Brass Shell List.

has been effected by which Carpet Tacks of all styles and weights are placed together as well as listed under the regular headings.

As is obvious from the lists herewith reproduced, the shape and size of the different lists varies greatly, the aim having been to give each list the smallest and most convenient arrangement possible. None of the lists are, however, more than 3½ x 6 inches in size, very few of them being as large as this and most of them very much smaller. In use it is intended that they shall be trimmed closely before they are inserted in price books, when they may be attached either by one edge close to the hinge of the book, as will, perhaps, be most convenient with the larger lists, permitting the use of the entire page for memoranda, or the smaller lists may be pasted on the page in connection with the entries in regard to discounts, freights, &c. Many of the lists are so compact in arrangement as when thus inserted to leave ample room for recording quotations and

#### Wrenches.

Inches.	6	8	10	12	15	18	21
Black...	\$9.00	\$10.00	\$12.00	\$14.00	\$24.00	\$30.00	\$36.00
Bright..	10.00	11.00	14.00	16.00	26.00	32.00	38.00

Fig. 1.—Wrench List.

the lists printed in the price book, inasmuch as there is a wide divergence in the methods of Hardwaremen in the use of such lists, and having them printed in the book is sometimes undesirable as occupying room which the merchant would prefer for other purposes. If the Hardwareman desires to insert his own list prices two courses are open to him: One to insert them with pen or pencil, which is laborious and occupies too much room; and the other to cut from price-list or catalogue the manufacturers' list and paste it in the price book. This is, however, unsatisfactory, as it involves the mutilation of the catalogues and lists which should be kept for reference, while at the same time the lists so inserted are inconvenient in size for the price book, in which space must be economized as much as possible. The Hardwareman desirous of following the best methods in this matter consequently labors under disadvantages which have made the keeping of the price book a somewhat difficult and unsatisfactory task.

In order to meet this difficulty and to facilitate the work of the Hardwareman in keeping a full and satisfactory record of prices *The Iron Age* is putting on the market a pamphlet (price 25 cents) containing the principal standard Hardware price-lists,

\* *The Iron Age* Standard Hardware Lists for Use in Price Books. Compiled by R. R. Williams, Hardware Editor of *The Iron Age*. Price 25 cents. David Williams, publisher and bookseller, 96-102 Reade street, New York.

#### Stove Hollow Ware.

Ground and Unground.

##### POTS, KETTLES, ETC. (CAST IRON.)

No.	6	7	8	9	10	11
Pots.....	\$0.65	.75	.85	1.00	1.25	1.75
Kettles.....	.55	.65	.70	.85	1.00	1.40
T Kettles.....	.75	.80	.90	1.00	1.25	....
Spiders.....	.27	.30	.35	.40	.50	.60
Griddles Round	.22	.25	.27	.30	....	....
" Long..	.40	.50	.60	.75	....	....

##### SCOTCH AND YANKEE BOWLS.

No.	1	2	3	4	5	6
Scotch Bowls..	\$0.35	.40	.45	.50	.60	.70
Yankee Bowls..	.35	.45	.55	.65	.75	.90

Fig. 2.—Stove Hollow Ware List.

separately or together, giving the prices of these goods in very compact and clear form. Some of the lists are also given in

the different elements of cost. Some of the lists cover a wider range of sizes than some merchants are interested in, and

in such cases the lists may be reduced in size by cutting off the superfluous part. In the File list, for instance, full information is given in regard to extras, some of

The following are the lists which are given in this pamphlet:

Auger Bits, Eastern Iron List,  
Augers, Western Iron List,

Bright Wire Goods, Cast-Iron Pots,  
Brass Butts, Horse and other  
Cast Butts, Rasps,  
Wrought Butts, Rivets,  
Carpenters' Slicks, Rivets and Burrs,  
Cartridges, Sauce Pans,  
Casters, Wood Screws,  
Chisels, Shells,  
Coach Screws, Spiders,  
Drawing Knives, Stocks and Dies,  
Files, Tacks,  
Glue Pots, Carpet Tacks,  
Gouges, Tapers,  
Griddles, Bent and Straight  
Strap and T Hinges. Trimmers,  
Eye Hoes, Solid Box Vises,  
Mortar and Field Washers,  
Hoes, Wire,  
Planters' and Cotton Wrenches,  
Hoes, Wrought-Iron  
Stove Hollow Ware, Goods.

Strap and T. Hinges.

Inches.....	3	4	5	6	7	8	10	12	14	16	18
Light strap.....	\$0.50	0.65	0.75	0.95	1.20	1.35	1.90	3.25	4.00	5.00	....
Heavy strap.....	.80	1.00	.07½	....	.07	.06¼	.06¼	.06¼	.06¼	.06¼	....
Light T.....	.60	.65	.75	.90	....	1.10	1.40	2.10	3.00	....	....
Heavy T.....	.80	.90	1.00	....	1.35	1.90	3.00	4.00	4.50	\$5.00	....
Extra heavy T.....	1.35	1.35	....	....	.08	.07¼	.07	.07	.07	....	....
Long chest.....	....	....	....	.90	....	1.10	1.40	1.75	....	....	....
Corrugated steel:											
Heavy strap..	....	.80	1.00	1.50	....	2.30	3.45	....	....	....	....
Ex. heavy T..	....	....	1.35	1.70	....	2.80	3.80	....	....	....	....
Hart's patent:											
Light strap....	....	....	....	1.15	....	1.70	2.30	3.90	....	....	....
Heavy strap..	....	1.00	1.25	1.75	....	2.85	4.25	....	....	....	....
Ex. Heavy T..	....	....	1.70	2.10	....	3.35	4.85	....	....	....	....

Fig. 3.—Strap and T Hinge List.

which may be deemed superfluous by some Hardwaremen. By removing this part of the list its size can be very considerably reduced.

Leather Belting, Rubber Belting,  
Round Boilers, Common Carriage  
Bolts, Brass Kettles,  
Cast-Iron Kettles,  
Lag Screws, Maslin Kettles,  
Mattocks.

Price-Lists, Circulars, &c.

THE YALE & TOWNE MFG. CO.,  
Stamford, Conn.: Chain Blocks.  
Illustrations are given of Weston's  
Differential Pulley Block and Weston's  
Triplex Spur-Gear Block, together with  
descriptions, price-lists, tabulated matter,  
&c. The manufacturers state their Dif-  
ferential Pulley Block gives back only 31

Cast and Wrought Butts.

Inches....	2 x 2	2 x 2½	2½ x 2	2½ x 2½	3 x 2½	3 x 3	3 x 3½	3½ x 3	3½ x 3½	4 x 4	4½ x 4½	5 x 5
Cast.												
Loose Pin.....	\$1.00	\$1.10	\$1.30	\$1.35	\$1.60	\$1.75	\$1.95	\$2.15	\$2.35	\$2.90	\$4.00	\$5.50
Loose Pin, Jap'd.	2.00	2.15	2.30	2.50	2.80	3.00	3.25	3.45	3.70	4.50	5.50	7.00
Wrought.												
F. J. Broad.....	.78	.93	....	1.08	1.35	1.44	1.80	1.90	2.16	3.12	4.20	5.40
Loose Pin.....	1.10	1.20	1.20	1.32	1.68	1.86	2.10	2.40	2.70	3.30	4.25	5.50
Loose Pin, Jap'd.	2.50	2.80	2.90	3.00	3.30	3.50	3.65	3.80	4.00	5.00	6.00	7.50
Inches....	¾	1	1½	1¾	1½	1¾	2	2½	2¾	3	3½	4
Wrought.												
Narrow and Lt. Nar..	..	\$0.28	....	\$0.36	....	\$0.43	\$0.50	\$0.60	\$0.66	\$0.72	\$0.90	\$1.44
L. P. Light Narrow.....	....	....	....	....	....	.56	.65	.78	.86	.94	1.10	....
Back Flaps..	....	.45	.50	.55	.60	.65	.70	.80	....	....	....	....
Lt. Inside Blind and Table	....	.45	.50	.55	.60	.65	.75	....	....	....	....	....
Parliament.....	....	....	....	....	....	....	....	....	1.50	1.60	1.80	1.90

Fig. 4.—Combined List of Cast and Wrought Butts.

The wide range of adaptability of these price-lists to the use for which they are intended is indicated in the fact that none of the lists given is too large for insertion in The Iron Age Hardware Price Books

Norway Iron Carriage Bolts,  
Philadelphia Pattern Carriage Bolts,  
Machine Bolts, Plow Bolts,  
Cut-Nail Card, Wire-Nail Card,  
Horseshoe Nails, Wire Nails in pack-  
ages, Nuts,

per cent. of the work expended by the operator, while their Triplex Block utilizes 80 per cent. of the workman's labor.

UNITED STATES CARTRIDGE COMPANY,  
Lowell, Mass., are sending with their compliments a conveniently arranged U.

Wire Nails.

Card  
June 1, 1889.

60d base.

Advance above 60d.

Common Fence, Shing- ling, Flooring and	2	3	4	5	6	7	8	9	10	12	16	20	30	40	50	60d
Common Brads.....	\$2.00	1.50	.90	.90	.65	.65	.50	.50	.40	.35	.35	.30	.20	.20	.10	base
Common & Car Barbed	2.25	1.75	1.15	1.15	.90	.90	.75	.75	.65	.60	.60	.55	.45	.45	.35	....
Casing, Smooth & Box	2.25	1.75	1.50	1.50	1.25	1.25	1.00	1.00	.90	.80	.80	.70	.60	.60	....	....
Barbed Box.....	2.50	2.00	1.75	1.75	1.50	1.50	1.25	1.25	1.15	1.05	1.05	.95	.85	.85	....	....
Slating.....	2.00	1.25	1.00	.90	....	....	....	....	....	....	....	....	....	....	....	....
Smooth Finishing.....	2.50	2.00	1.75	1.75	1.50	1.50	1.25	1.25	1.00	.90	.90	.80	....	....	....	....
Barbed Finishing.....	2.75	2.25	2.00	2.00	1.75	1.75	1.50	1.50	1.25	1.15	1.15	1.05	....	....	....	....
Fine.....	2.50	2.00	1.75	....	....	....	....	....	....	....	....	....	....	....	....	....
Clinch.....	3.00	2.00	1.50	1.50	1.00	1.00	.90	.90	.75	.60	.60	.50	....	....	....	....
Tobacco.....	....	....	1.00	1.00	.75	.75	.60	.60	.50	....	....	....	....	....	....	....
Hinge.....	....	....	1.75	....	1.50	....	1.25	....	1.00	....	....	.75	....	....	....	....
Wire Spikes, all sizes, 50¢ advance.																
Inch.	¾	1	1½	1¾	1½	1¾	2	2½	2¾	3	3½	4	4½	5	6	base
Lining.....	....	\$3.50	3.00	2.50	....	....	....	....	....	....	....	....	....	....	....	....
Barbed Roofing.....	....	\$3.00	2.50	2.00	1.75	1.50	....	1.25	1.00	.90	....	....	....	....	....	....
Barrel.....	....	\$3.00	2.50	2.00	1.75	1.50	1.25	.90	....	....	....	....	....	....	....	....

Fig. 5.—One Arrangement of Wire Nail Card.

A and B, the smallest of the series; while in the larger books, C, D and E (multiple index), there is, of course, ample room for their insertion.

Stove Bolts, Tire Bolts,  
Scotch and Yankee  
Bowls, Brads,  
Sand and Emery  
Paper,  
Picks,  
Wrought-Iron Pipe,  
Plane Irons,

S. Climax Score Book, for shot gun or rifle. The leaves, which are perforated, have spaces for place, referee, conditions, date and judges, together with lines for the names of 15 contestants, for yards and

for the score. Two pages are used to call attention to their Climax Shot Shells and to the U. S. Cartridges.

GEORGE H. HUTTON & CO., Baltimore, Md.: Patent Jump Seat Irons, and specialties in Carriage Hardware. They furnish Jump Seat Irons and Body Irons complete, with right to use their patent Buckboard body; or, they can furnish the Jump Seat Irons and Lazy Back Irons combining dos-a-dos, separate, leaving the choice of style of body to the manufacturer.

ETTE & HENGER MFG. COMPANY, St. Louis, Mo.: Hardware Catalogue No. 3. They manufacture specialties in Hardware, Plumbing Goods, also Water Work and Electrical Supplies. The catalogue referred to contains 105 pages, fully illustrated, with price-lists, and bound in stiff cloth covers. The goods shown are Cocks, Gong Bells, Lawn Sprinklers, Grindstone Fixtures, Hay Fork Pulleys, Chains, Chain Pump Fixtures, Parlor Door Hangers, Dog Irons, Brackets, Registers, Tire Benders, Swage Blocks, Water Tuyere Irons, &c. The catalogue is printed in attractive style and well arranged.

W. S. ESTEY, 71 Fulton street, New York: Wire Cloth, Wire Work, Wire Railings, Wire Goods, &c. Catalogue No. 12 illustrates and gives price-lists of a large line of the above goods, among which Wrought-Iron Window Guards, Ornamental Wrought-Iron Fence and Balcony Railings are prominent. The works of the above firm are located in Brooklyn, N. Y.

ST. LOUIS RAILING WORKS, St. Louis, Mo.: Wrought Iron Fence, Lawn Furniture, Stable Fixtures, Vault Doors, Gates, Arches, Trellises, Tree Guards, Window Guards, Flower-Pot Stands and Woven-Wire Fencing. A second catalogue is devoted to art metal work, including plain and ornamental work in Wrought Iron, Wire and Brass, Bank and Office Railings, polished Brass Store and Window Fixtures, Wickets and Grilles, Elevator Inclosures, antique and modern Electro Plating and Stair Rails. These goods are tastefully shown, and the various patterns are well adapted to the uses for which they are designed. The firm also make a special feature of the manufacture of custom work made to order from original drawings and details furnished by architects.

THORSEN & CASSADY, 50 Wabash avenue, Chicago, Ill.: Skates, Revolvers, Loaded Shells, Rifles, Smith, Belgian, Floberts, &c., Breech-Loading Double Guns. Special prices are quoted on some leading goods.

THE MCINTOSH-HUNTINGTON COMPANY, Cleveland, Ohio, advise the trade that they will offer a full line of Bicycles and accessories for next season. They desire correspondence from those who expect to handle this line of goods the coming season, as they believe they can offer some inducements.

TWO STORIES under the titles of "An Arkansaw Mule" and "A Pot of Gold," are published under one cover in the interests of the Oliver Chilled Plow Co. of South Bend, Ind. The former story is written in Southern dialect, and the reading matter is interspersed with artistic illustrations. Those who are familiar with the phases of Southern life will appreciate it.

THE SUN NOVELTY WORKS, Greenfield, Ohio: Coffee Mills, Rat Traps, Clothes Racks and Clothes Line Props. Their catalogue is accompanied by three illustrated pamphlets, entitled respectively: "The Coffee Mill and Dinah," "Coffee, or the Trials of Celibacy," and "A Rat Story." These are unique in their way, and are presumably for gratuitous distribution among the trade.

FLAX FIBERWARE COMPANY, Syracuse, N. Y.: Price-list of Flax Fiber Ware, relating to Chamber Pails, Wash Basins, Slop Jars, Slop Jar Mats, Water Pails and Spittoons.

NASON MANUFACTURING COMPANY, 71 Beekman street, New York: Wrought and Cast-Iron Pipe, &c. Brass and Iron Valves and Fittings and general supplies for steam, gas, water, ammonia and oil. Also steam and gas fitters' and plumbers' Tools and Supplies, steam and hot-water heating specialties. Their catalogue of 240 pages gives illustrations and price-lists of these goods and is accompanied by a discount sheet. Also a pamphlet devoted to their Equator Steam Heater and the Gulf Stream for hot water.

## Paints and Colors.

*It should be understood that the prices quoted in this column are strictly those current in the wholesale market, and that higher prices are paid for retail lots. The quality of goods frequently necessitates a considerable range of prices.*

The distribution of Paints and Colors has been on a rather small scale during the past week, yet it would appear from the reports of manufacturers and jobbers that the quantity of goods turned is quite in line with what is customary at this season of the year. The Southern trade have purchased staples in the house-painters' line to a very fair extent and from that and other sections there has been quite a good run of orders for prepared Paints for decorative purposes and artists' materials and other specialties particularly adapted to the holiday trade. Changes in prices have been few and unimportant. Some jobbers are putting favorite brands of White Lead out to the retail trade in 500-lb lots at less than the corrodors' list price for 12-ton lots, and Putty is selling *sub-rosa* at 5¢ per 100 lb below the lowest figures openly quoted. Otherwise it does not appear that there is any unusual movement in values and the trade is comparatively free from disturbing influences.

**White Lead.**—The local and near-by demand for this pigment is momentarily slow, but very fair orders come in from some out-of-town points, and the general distribution is represented as being well up to the November average. One or more jobbing firms are naming exceedingly low prices on some of the popular brands manufactured for city corrodors and thereby give the market a very unsettled appearance. For example, lots of 500 lb. have been sold at 6½¢, while the corrodors' net price for 12-ton lots is a small fraction above that. Corrodors are not deviating in the least from the official list, and the "cut" made by jobbers is undoubtedly at the latter's expense. Mixed Leads are selling at somewhat variable prices, but no lower than heretofore this month.

**Zincs.**—Orders for American Oxide are not coming in very freely at the moment, but manufacturers state that they are well employed on old contracts and that deliveries still absorb a large portion of the current output. The old line of prices is adhered to and the market preserves a very steady tone. Foreign brands are selling in a moderate way only at the moment, but importations are not excessive and former prices for the various brands are maintained.

**Colors.**—Fairly good purchases of base Colors are making by grinders, and for pretty much everything in that line prices remain very steady. Dry Colors for house-painters' use find limited sale, however, and the movement in Oil Colors is of routine character. Prices have undergone no change of importance, and, drawing the line at second-quality goods, which are more or less irregular the most of the time, values remain quite steady.

**Putty.**—Competition in this line continues keen, and prices are still very unsettled. Some brands are selling at as low as 1½¢ for barrels, and at corresponding figures for smaller packages.

**Chalk, Whiting, &c.**—Block Chalk has been sold ex-steamer at a very low figure, equivalent to about \$1.75 delivered, and the market is rather weak. Whiting is unchanged, manufacturers being well employed on old contracts.

## Oils and Turpentine.

Some branches of the market for animal and vegetable Oils have been more animated and others have remained listless in the absence of incentive to freer action on the part of buyers. Taken as a whole, however, the volume of business appears to have been larger than during the preceding week, and there are inquiries on the market at the present time that promise to lead to important trades in the near future. Prices have undergone very little change, and, with few exceptions, the undertone is fairly firm. The most prominent exception is cotton-seed products, which, for the time being, are unfavorably affected by the narrowness of export outlet.

**Linseed Oil.**—The National Company are again in the Eastern field looking for orders, and, while not openly quoting lower prices, the concern's representatives have made overtures that lead buyers to believe that offers of 34¢ for carload lots would not go begging, although 35¢ @ 36¢ are given as the nominal prices. Other out of town companies, it is said, have met the National Company's prices. The latter interest is believed to have caught up with old orders, and to be more belligerent in view of that fact and a reaction in the market for raw material. City crushers have made no change in their prices, and to all accounts they still getting the lion's share of the trade in this city and immediate vicinity.

**Cotton-Seed Oils.**—Without decided change one way or the other in prices the market has presented an unsettled appearance, and the undertone is still rather weak. Exporters are picking up fair-sized parcels of both crude and refined product that amount to considerable in the aggregate, but orders for large lots are extremely few and come with a limit on price about 2¢ below sellers' ideas of value. Lard refiners have taken a few round lots for shipment direct from the mills, paying prices on a parity with those current in the local market at the present time, but most home consumers are still buying in a very conservative way. Latest sales were at 29¢ for prime crude, 29¢ for prime Summer Yellow and corresponding prices for off grades.

**Fish Oils.**—In the New Bedford market about 1300 barrels of crude Sperm Oil have been sold for export at 68¢ and the supply at that center is reduced to 9600 barrels. Of crude Whale Oil only 7700 barrels remain there. This strong position of the crude article keeps the market for the manufactured products in good shape, and prices remain firm all along the line. There have been no new developments in the market for Menhaden Oils, and prices for all varieties remain unchanged.

**Lard Oil.**—City pressers have kept the output of prime Oil close sold up at last week's prices and are still enjoying a very good demand. Sellers of Western have also found a very good market. Prices have ruled quite firm at 54¢ for both city and out of town brands, and some sellers are quoting 1¢ advance.

**Miscellaneous.**—Olive Oil in barrels has met with somewhat freer sale, and prices are steadier, but no higher. Coconut Oils are steady at last week's prices, late arrivals having been closely worked off. Red Oils are quiet and unchanged.

**Spirits Turpentine.**—The quantity of Spirits in stock here is moderate, and supplies at Southern centers are only fair. However, the demand has been running light and prices, after temporary improvement, are now rather weak.

**Cyclone Halter Buckles.**

The E. Covert Mfg. Company, Farmer Village, N. Y., are introducing Cyclone Halter Buckles, as shown in the make-up of the halters illustrated in Figs. 1 and 2. Four of these buckles compose a set for one halter, and by punching a sufficient number of holes in the neck and cheek straps the halter may be changed to any desired size in a short time. The illus-

trations show the buckles as they are used in the construction of two styles of halters. The manufacturers claim that the buckles are light, neat, low in price, and that they are the only buckle that can be used in the construction of any style of leather halter that will admit of changing the size as necessity demands, to fit a colt or a full-grown horse.



Fig. 1.—Halter with Cyclone Halter Buckles.



Fig. 2.—Halter Converted Into a Bridle.

trations show the buckles as they are used in the construction of two styles of halters. The manufacturers claim that the buckles are light, neat, low in price, and that they are the only buckle that can be used in the construction of any style of leather halter that will admit of changing the size as necessity demands, to fit a colt or a full-grown horse.

**Black Diamond Horse-Nail Box.**

Horton, Gilmore, McWilliams & Co. of Chicago have devised a new method of packing their Black Diamond horse nails,



Black Diamond Horse-Nail Box.

which is herewith illustrated. They use the ordinary 25-pound box, but instead of filling it with loose nails, they pack it with boxes containing 5 pounds each. The small boxes are like the large one, neatly dovetailed and provided with a sliding

**Fiber Ware.**

"What is fiber ware?" is a question asked by many in regard to the product of the Standard Fiber Ware Company of

Mankato, Minn., including pails, chamber sets, decorated spittoons, cuspidors, bowls, milk pans, &c. These articles are made of flax tow. The raw tow raised on the Dakota prairies is taken by this company and put through a process of beating, bleaching, pressing, calendering, trimming, intensely hot water-proof baths, bakings and rebakings, painting, japaning, decorating and, finally, marketing. These goods, we are advised, are meeting with ready sale and are referred to as having special advantages. The company advise us, under date of the 9th inst., that they are far behind their orders for decorated goods, although having double the

the phrase, which they term the old stereotyped one, of "Best English steel imported at great expense," has no place in connection with American-made goods, because they remark:

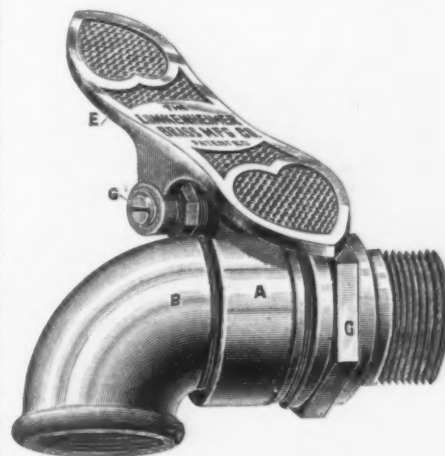
It is known and proven that American steel cannot be excelled by any imported; and cutting tools made from American steel stand the test, we believe, better than any that have been made from foreign steel.

They state in support of this assertion that they have in their possession hundreds

of plane irons made by one of the best makers in England and from the best steel for the purpose, and that will not stand the test of carpenters as well as the American bits made by them.

**A New Foot Radiator Valve.**

The Lunkenheimer Brass Mfg. Company, Cincinnati, Ohio, have recently put on the market a new form of foot radiator-



A New Foot Radiator Valve.

valve that will be of interest to the steam and hot-water heating trades. A general view of the device is shown in the accompanying illustration, from which its operation will be readily understood. The manufacturers especially mention that the valve is constructed on practical principles and will not easily get out of order, a very important consideration in radiator valves. The disks are secured to the operating stem and adapted to close against taper-

force employed in this department as compared with a year since.

Gage Tool Company, Vineland, N. J., put in a plea for the use of American steel by edge-tool manufacturers. They think

ing seats in the valve shell, and being provided with ball and socket bearings at their back are evenly wedged against their seats when the valve is closed by the pedal. The stem is provided with a tapering flange upon which bears a non-rotating friction washer. Upon this washer and bearing down upon the flange of stem the packing is compressed in the usual way by the packing nut. It is pointed out that any necessary friction can be brought to bear on the flanged stem, making the valve work easy or hard as desired. The disks are said to be under perfect control of the detachable pedal and remain at any desired opening.\* It is further pointed out that the valve will not jar open. These valves are made in five sizes, from  $\frac{3}{4}$  to 2 inches.

#### Wakefield Pipe Wrench and Attachments.

J. E. Wakefield, Worcester, Mass., is introducing this wrench, with special attachments for handling finished work, as shown in the accompanying illustrations. The wrench as shown in Fig. 1 is referred to as being quick of adjustment, it only being necessary to spread the handles to cause the sliding jaw to move up to the work; also that the sliding jaw is actuated

in Fig. 2 are attached to the wrench jaws, the toothed one for pipe work and the plain plate for finished nuts. The plates are

position lining, so as not to deface the finest work. It is stated that the clamp can be used only in the Wakefield wrench.

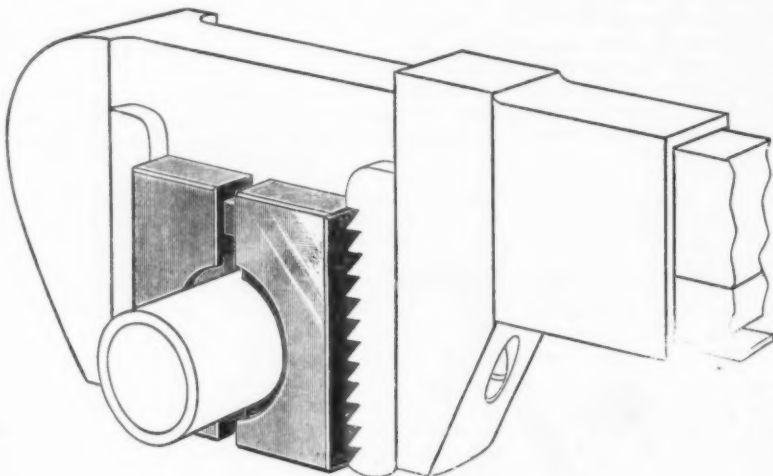


Fig. 4.—Clamp in Wakefield Wrench.

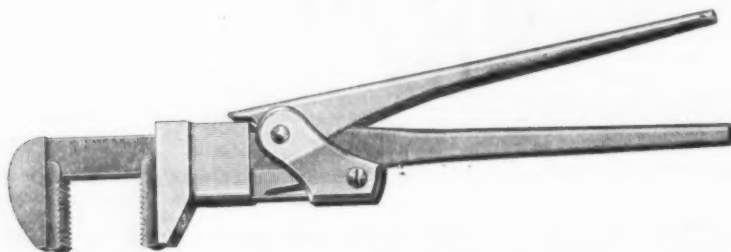


Fig. 1.—Wakefield Pipe Wrench.

on an entirely new principle, and will not crush the pipe. The maker claims that the wrench will not catch or lock the pipe; that it can be used in close quarters, as in

out upsetting or pulling around the corners, as the sliding jaw takes up all lost motion. The toothed plates can be taken off and sharpened, or new ones can be ob-

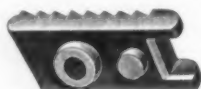


Fig. 2.—Toothed and Plain Plates.

taking short nipples out of coils, radiators, boilers, &c.; that it can be used at any angle; that there is absolutely no lost motion, and that the parts are all made to

tained at a small expense. The clamp, Fig. 3, is shown opened to receive the pipe, while Fig. 4 shows its use in connection

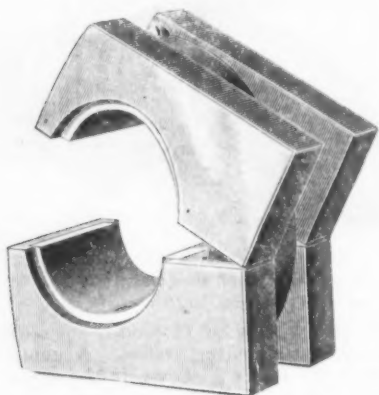


Fig. 3.—Wakefield Wrench Clamp.

gauge, and are interchangeable. The wrenches are made in five sizes, with openings from 1 to 3 inches. The plates shown

with the wrench. The clamp is designed to be used on brass, nickel-plated and finished work, and is provided with a com-

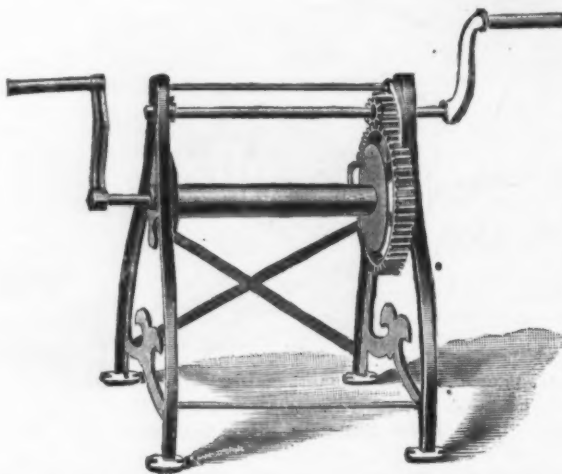
Each tool is guaranteed by the manufacturer.

#### Single and Double Geared Windlass.

Bernard Gloekler, 1117 and 1119 Penn avenue, Pittsburgh, Pa., is offering the trade this article, as illustrated herewith. The winding drum is 20 inches long; height of machine, 32 inches, and its total weight is 125 pounds. It is a single and double geared windlass, and as a result of this arrangement a light load can be raised quickly by the use of the single-gear crank. The point is made that by using the single-gear crank but one-half the time is required that would be consumed in the use of the double-gear crank. It is claimed that the capacity of the windlass, in connection with a single block, is 1000 pounds, and with a double block is 2000 pounds. The windlass is recommended for use where some hoisting machine cheaper than an elevator is desired; also for butchers' use in hoisting dressed beef up to a runway.

#### New Lumber-Cutting Machine.

A new lumber-cutting machine was tried last week at the works of the Bradley Draw Cut Lumber-Cutting Company, Greenpoint, L. I. The machine, upon which Dr. Bradley and Thomas S. Crane



Single and Double Geared Windlass.

of Newark have been working for the past five years, is 42 feet long, 15 feet wide and 8 feet high. Its weight is 45

tons. The object of this invention, which may largely do away with the use of buzz saws, is to economize time and the lumber itself. The machine will take a log 8 feet long and cut boards from it at the rate of 40 a minute of any width from  $\frac{1}{2}$  inch to 1 inch in thickness. There is not the slightest waste of material in the cutting. It is calculated that when saws are used one-fourth of the wood is wasted in sawdust and planing if inch boards are being cut. The knife is 3 feet long and weighs 500 pounds. It works with a draw motion, a sort of combination of knife and saw, which prevents the fibers of the wood from breaking. A roller preceding the knife compresses the wood and aids in this matter, which the inventors found was the most difficult of the ends to be attained. The knife is moved by a wooden connecting rod fastened to a wheel 10 feet in diameter. Every revolution of this wheel makes a board. The machine is fed by an apparatus which is controlled by two screws set in babbitt metal. A chain gear connects the two screws so that they move with absolute accuracy, thus making the boards exactly the same width from one end to the other. A system of cogs is so arranged that by changing the size of the cog wheel the width of the board to be cut is regulated. The total output of the machine when in running order will be from 80,000 to 100,000 feet a day.

## NEW PUBLICATIONS.

CASSIER'S MAGAZINE. Engineering Illustrated. Published by Cassier Magazine Company, New York. Monthly; 25 cents a number.

Another candidate for the favor of the engineering profession appears in the first or November number of the above magazine. In a sub-head we find it is devoted to engineering, industry, steam, electricity, power. It is handsomely printed on heavy calendered paper, the engravings being sharp and clean.

The first article is on the Philosophy of the Multiple-Expansion Engine, by Prof. R. H. Thurston. Further on is a biographical sketch of the professor, accompanied by an excellent portrait and views of his home. Prof. Geo. I. Alden discusses the Effect of Compression upon Shaft Friction. He concludes as follows:

These results show that even with the high degree of compression used there is certainly no increase of friction, but rather a small diminution; and as the engine will work with considerably less compression than was assumed in these calculations, it is reasonable to conclude that so far as shaft friction is concerned this engine will, on account of the special features of its design, by which a considerable degree of compression is necessary, be more efficient than the same engine running without compression; and it seems quite probable that an application to engines of various types of the analysis above outlined may show that in general suitable compression in an engine results in increasing the efficiency of the engine by diminishing the total engine friction.

Prof. John E. Sweet has an instructive article on Steam Engine Breakdowns, and C. H. J. Woodbury one on Methods of Reducing the Fire Loss.

On the subject of Welding and Flanging Boiler Plates communications are published from several well-known boiler-makers. The work on the Galloway boilers, built by the Edge Moor Iron Company, requires flanging and welding on plates ranging from  $\frac{3}{8}$  to  $\frac{9}{16}$  inch thick. They avoid local heating for the purpose of flanging, as it is difficult to regulate this heat so as to avoid burning the steel. All their boiler-head flanging is done by heating the entire plate in a furnace to a low red heat, and then die flanging at one heat and operation. With their conical tube plates they are obliged to heat locally for both welding and flanging,

and to do this successfully requires the best soft steel. They invariably anneal all steel that has been partially heated, and also all steel plates that have been sheared or punched. James Tappan expresses the opinion that the proper heating for flanging does no injury to the steel unless overheated. Boiler steel of low carbon, sulphur and phosphorus can be successfully welded. Other makers also expressed the opinion that steel was not injured by heating and flanging if properly heated.

Other articles in this number are: The Early History of the Steam Engine, Steam Power and the Coal Bill, Subdivided Power, Profit Sharing Abroad, &c.

## Trade Publications.

B. W. PAYNE & SONS of Elmira, N. Y., and 45 Dey street, New York City, have issued an illustrated circular describing their compound engines. This firm were among the first to build compound engines, which have been received with marked favor. They build nine sizes of compounds ranging from 60 to 275 horse-power, condensing or non-condensing, as may be required. The circular states that "Where used non-condensing the saving in fuel will be from 20 to 30 per cent. over the best automatic engine. The condensing engine effects a saving of 40 to 50 per cent. over the automatic compound engines, also requires far less boiler capacity than the automatic." In designing these engines—cross and tandem compound, side and center crank—the aim has been to produce the best engines upon the market. The frame is heavy, with the metal so distributed as to best resist the strains. In the tandem type the high-pressure cylinder is attached directly to the frame, next to the crank, thereby permitting the removal of the piston rod and heads through the low-pressure cylinder. The valves are perfectly balanced.

THE NICHOLSON & WATERMAN MFG. COMPANY of Providence, R. I., describe, in a neat catalogue, their horizontal boring and drilling machines. In their preface they say: "The mechanical act of boring or drilling a hole is of itself a simple operation. The great variety of shapes which the many different machines used in this world assume, together with the equally great range in sizes and weights, has developed the following line of tools for doing this work. While we believe certain types of machines possess more inherent accuracy than others, yet the shape of the piece oftentimes requires a tool in which the convenience for handling the work is the first requirement. Where great numbers of one piece are to be operated on, the best results are usually obtained from a special machine adapted to the individual piece and operation. In the larger number of cases, however, a tool of general use is required, the choice between one pattern and another being determined by the size and shape of the work, and the quantities and values involved. Constant contact with the users of our machinery, and frequent subjection to their criticisms, both good and bad, has enabled us to select those designs best adapted to the various conditions."

FROM THE DIAMOND MACHINE COMPANY of Providence, R. I., we have received a catalogue of 120 pages describing and fully illustrating their grinding and polishing machinery, engine and hand lathes, emery wheels and polishing supplies. The catalogue shows the vast number of uses to which the emery wheel is now applied and the wide range of work for which it is applicable.

ALEX LAUGHLIN & Co., Pittsburgh, Pa., widely known as builders of regenerative gas furnaces and gas producers, have just published a series of very interesting designs, covering their specialties, in a neatly-bound volume. Among the designs illustrated is a gas heating furnace with a solid hearth, a Siemens heating furnace, a regenerative tube furnace, open hearth and crucible steel furnaces, vertical soaking pits, a Siemens glass pot furnace, a Siemens gas producer, a Reuleaux gas producer, and the Wellman and London producers, the latter being specially designed for saw dust, peat, and similar low-grade fuels.

The basic process has just been introduced at the Domnarfret Works, Falun, Sweden.

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<b>Clamps—</b>	
A. L. Tool Co.'s Wrought Iron.....	25¢
Adjustable, Cincinnati.....	15¢10¢
Adjustable, Hammers.....	15¢
Adjustable, Stearns.....	30¢80¢10¢
Stearns' Adjustable Cabinet and Corner.....	30¢80¢10¢
Cabinet, Sargent's.....	60¢10¢
Carriage Makers', Sargent's.....	70¢10¢
Carriage Makers', P. S. & W. Co.....	40¢10¢
Eberhard Mfg. Co.....	40¢50¢40¢10¢
Warner's.....	40¢10¢40¢10¢5¢
Saw Clamps, see Vices, Saw Filers'.	
Carpenters', Cincinnati.....	25¢10¢
<b>Cleavers.</b>	
<b>Butchers'.</b>	
Bradley's.....	25¢30¢
L. & J. White.....	20¢5¢
Seatty's.....	40¢40¢25¢
New Haven Edge Tool Co.'s.....	40¢
P. S. & W.....	33¢45¢33¢10¢
Poster Bros.....	30¢
Schulte, Lohoff & Co.....	40¢40¢25¢
<b>Clips—</b>	
Norway, Axle, 1/4 & 5-16.....	55¢5¢5¢
2nd grade Norway Axle, 1/4 & 5-16.....	65¢5¢
Superior Axle Clips.....	65¢45¢70¢
Norway Spring Bar Clips, 5-16.....	60¢5¢5¢
Wrought-Iron Felice Clips.....	7¢, 8¢, 9¢
Steel Felice Clips.....	7¢, 8¢
Saker Axle Clips.....	25¢
<b>Cloth and Netting, Wire—See</b>	
<b>Wire, &amp;c.</b>	
<b>Cockeyes.....</b>	<b>50¢</b>
<b>Cocks, Brass.....</b>	<b>50¢25¢</b>
<b>Hardware List.....</b>	<b>50¢25¢</b>
<b>Coffee Mills—See Mills, Coffee</b>	
<b>Collars, Dog, &amp;c.</b>	
Medford Fancy Goods Co.....	40¢10¢
Embossed, Gift, Pope & Steven's list.....	30¢10¢
Leather, Pope & Steven's list.....	40¢
Brass, Pope & Steven's list.....	40¢
Chapman Mfg. Company.....	50¢10¢60¢
<b>Combs, Curry.</b>	
Fitch's.....	50¢10¢50¢10¢10¢
Rubber, per doz.....	10¢00¢
Perfect.....	50¢
Kellogg's.....	50¢10¢
Sweet & Clark's.....	50¢10¢
<b>Compasses, Dividers, &amp;c.—</b>	
Compasses, Calipers, Dividers.....	70¢70¢10¢
Bentley & Call Co.'s.....	
Dividers.....	60¢5¢
Compasses & Calipers.....	50¢5¢
Wing and Inside or Outside.....	50¢5¢
Double.....	60¢
(Call's Pat. Inside).....	30¢
Excelsior.....	50¢
J. Stevens & Co.'s.....	25¢10¢
Starrett's.....	
Spring Calipers and Dividers.....	25¢
Lock Calipers and Dividers.....	25¢
Combination Dividers.....	25¢
<b>Coopers' Tools—See Tools, Coopers'.</b>	
<b>Cord—</b>	
<b>Sash.</b>	
Common.....	10¢, 10¢ @ 11¢
Patent, good quality.....	12¢, 12¢ @ 12¢
White Cotton Braided, fair.....	24¢ @ 25¢
Common Russia Sash.....	12¢ @ 13¢
Patent Russia Sash.....	14¢
Cable Laid Italian Sash.....	21¢ @ 22¢
India Cable Laid Sash.....	22¢
Silver Lace—	
A Quality, White, 50¢.....	25¢
A Quality, Drab, 55¢.....	25¢
B Quality, White, 30¢.....	10¢
B Quality, Drab, 35¢.....	10¢
Sylvan Spring Extra Braided White, 34¢	
Sylvan Spring Extra Braided, Drab, 39¢	
Semper Idem Braided, White.....	30¢
Egyptian, India Hemp, Braided.....	25¢
Massachusetts, White.....	25¢
Samson—	
Braided, White Cotton, 50¢.....	30¢30¢5¢
Braided, Drab Cotton, 55¢.....	30¢30¢5¢
Braided, Italian Hemp, 55¢.....	30¢30¢5¢
Braided, Linen, 80¢.....	30¢30¢5¢
Tate's Cotton Braided, White.....	30¢, 28¢
<b>Wire Picture.</b>	
Braided or Twisted.....	75¢10¢
<b>Corkscrews—See Screws, Cork.</b>	
<b>Corn Knives and Cutters—See</b>	
<b>Knives, Corn.</b>	
<b>Crackers, Nut—</b>	
Table (H. & R. Mfg. Co.).....	40¢
Blake's Pattern.....	10¢
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<b>Cradles—</b>	
Grain.....	50¢55¢20¢50¢10¢25¢
<b>Crayons.</b>	
White Crayons, gross.....	10¢
D. M. Stewart Mfg. Co., Metal Work.....	25¢
D. M. Stewart Mfg. Co., Rolling Mill.....	25¢
See also Chalk.	
<b>Crow Bars—See Bars, Crow.</b>	
<b>Curry Combs—See Combs, Curry.</b>	
<b>Curtain Pins—See Pins, Curtain.</b>	
<b>Cutters—</b>	
<b>Meat.</b>	
Dixon's * dos.....	40¢5¢
Nos.....	1 2 3 4
1.....	14.00
2.....	17.00
3.....	19.00
4.....	20.00
Woodruff's * dos.....	40¢5¢
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**Hangers—**

Barn Door, old patterns...	60&10&10@70c
Barn Door, New England...	60&10&10@70c
Samson Steel Anti-Friction...	55c
Orleans Steel...	55c
Hamilton Wrought Wood Track...	55c
U. S. Wood Track...	55c
Champion...	60&10c
Rider and Wooster, Medina Mfg. Co.'s...	70c
Climax Anti-Friction...	55c
Climax Anti-Friction for Wood Track...	55c
Zenith for Wood Track...	55c
Reed's Steel Arm...	50c
Challenge, Barn Door...	50c
Stirling...	50&50&10c
Victor, No. 1, \$15.00; No. 2, \$16.50; No. 3, \$18.00...	50&25c
Cheritree...	50&10c
Zipper...	50&10&60c
Boss...	60&10c
Best Anti-Friction...	60&10c
Duplex (Wood Track)...	60&10&5c
Terry's Pat., 7/8 doz pr 4 in, \$10.00; 5 in, \$12.00...	50&10c
Terry's Steel Anti-Friction Leader 50&10c	
Terry's Steel Anti-Friction Ideal 50&10c	
Cronk's Patent, Steel Covered...	50&5c
Wood Track Iron Clad, 7/8 ft, 10c...	60

Carrier Steel Anti-Friction...	50&10c
Architect, 7/8 set \$6.00...	20c
Eclipse...	20&10c
Felix, 7/8 set \$4.50...	20c
Richards...	30&30&10c
Lane's Standard...	50&5&50&10c
Lane's New Standard...	50&50&5c
Lane's Parlor...	40c
Ball Bearing Door Hanger...	20&10&30&10&10c
Warner's Pat...	20&10&30&10&10c
Stearns' Anti-Friction 20&10&30&10&10c	
Stearns' Challenge...	25&10&25&10&10c
Faultless...	40&40&5c
American, 7/8 set \$6.00...	20&10c
Sider & Wooster, No. 1, 62 1/2¢; No. 2, 75¢...	40c
Paragon, Nos. 1, 2 and 3...	40&10c
Cincinnati...	25&10c
Paragon, Nos. 5, 5 1/2, 7 and 8...	20&10c
Crescent...	60&60&10c
Nickel Cast Iron...	50c
Nickel, Malleable Iron and Steel...	40c
Scranton Anti-Friction Single Strap...	35c
Wild West, 4 in. Wheel, \$15.00; 5 in. Wheel, \$21.00...	45c
Star...	40&10&40&10&5c
May...	50&5&50&10c
Interstate...	40&10c
Magie...	50c

**Harness Snaps—See Snaps.****Hatchets—**

American Axe and Tool Co.	
Blood's...	
Hunt's...	
Hurd's...	
Mann's...	
Peck's...	
Underhill's...	40 & 10
Buffalo Hammer Co.	50&25c
Fayette R. Plumb...	
C. Hammond & Son...	
Kelly's...	
Sargent & Co.	
P. S. & W. Co.	
Ten Eyck Edge Tool Co.	
Collins...	10c
Schulte, Lohoff & Co.	50&50&5c

**Hay and Straw Knives—See****Knives.****Hinges—****Blind Hinges—**

Parker...	75&25c
Palmer...	50&5&10c
Seymour...	70&25c
Butler...	50c
Clark's, Nos. 1, 3, 5, 40 and 50...	75&10&5&10&5c
Clark's Morris Gravity...	75&10&5&10&5c
Sargent's No. 12...	77&10&10c
Reading's Gravity...	75&10&75&10&5c
Shepard's...	
Noiseless...	75&10c
Niagara...	80c
Buffalo...	80c
Clark's Genuine Pattern...	80c
O. S. Lull & Porter...	75&10c
Acme, Lull & Porter...	75c
Queen City Reversible...	75&10&25c
Clark's Lull & Porter, No. 0, 1, 1 1/2, 2, 2 1/2, 3...	75&10&25c
North's Automatic Blind Hinges, No. 2, for Wood, \$9.00; No. 3, for Brick, \$11.50...	10c

**Gate Hinges—**

Western...	7/8 doz \$4.40, 60c
N. E. Reversible...	7/8 doz \$7.00, 55c
M. E. Reversible...	7/8 doz \$6.20, 55&10c
Clark's, Nos. 1, 3, 5, 2...	60&10&5c
Y. State...	7/8 doz \$5.00, 55&10c
Automatic...	7/8 doz \$12.50, 50c
Common Sense...	45&10c
Seymour's...	60&10&5c
Spring Hinges...	
Geer's Spring and Blank Butts...	40c
Union Spring Hinge Co.'s list, March...	
Acme...	25&10c
U. S. S...	25&10c
Empire and Crown...	25c
Hero and Monarch...	25c
American, Gem, and Star...	20c
Oxford...	25c
Barker's Double Acting...	25c
Union Mfg. Co.	25c
Buckman's...	15&20c
Chicago...	30c
Wiles...	40c
Devore's...	40c
Rex...	40c
Royal...	60c
Reliable...	60c
Champion...	60c
Bardley's Patent...	40c
Stearns'...	40c
Samson, 7/8 gross...	\$14.00

**Wrought Iron Hinges**

Strap and T...	50&10c
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Corrugated Strap and T...	50 & 10c
Screw Hook and Strap...	14 to 20 in, 7/8 doz, 35c
Strap...	22 to 36 in, 7/8 doz, 35c
Screw Hook and Eye...	1/4 in, 7/8 doz, 75c
Eye...	1/2 in, 7/8 doz, 55c
Eye...	3/4 in, 7/8 doz, 45c
Roller Blind Hinges, Nos. 32 and 34...	50&10c
Roller Blind Hinges, Nos. 232 and 234...	50&10c
Roller Plate...	70&10c
Roller Raised...	70&10c
Plate Hinges (8, 10 & 12 in, 7/8 doz)...	50c
"Providence" over 12 in, 7/8 doz...	45c

**Hoes—****Eye—**

D. & H. Scovill...	20c
Lane's Crescent Planter Pattern...	45&5c
Lane's Razor Blade, Scovill Pattern...	30c
Maynard, S. & O. Pat...	45&5c
Sandusky Tool Co., S. & O. Pat...	50&10&5c
Am. Axe and Tool Co., S. & O. Pat...	60c
Chattanooga Tool Co., S. & O. Pat...	60c
Grub...	60&10c

**Handled—**

Garden, Mortar, &c...	70c
Planter's Cotton &c...	70c
Warren Hoe...	60c
Magie...	7/8 doz \$4.00

**Hog Rings and Ringers—See****Rings and Ringers.****Holisting Apparatus—See****Machine, Holisting.****Hollow-Ware—See Ware, Hollow.****Holders.**

Bag...	
Sprengle's Pat...	7/8 doz \$15.00, 60c
Bit...	
Extension...	40c
Barber's, 7/8 doz \$15.00...	40&40&10c
Ives, 7/8 doz \$20.00...	60&5&60&10c
Diagonal...	7/8 doz \$24.00, 40c
Angular...	7/8 doz \$24.00, 40&5c
File and Tool...	
Bals Pat...	7/8 doz \$4.00, 25c
Nicholson File Holders...	50c
Dick's Tool Holder...	20c

**Hooks—**

Cast Iron—	
Bird Cage, Sargent's list...	60&10&10c
Bird Cage, Reading...	60&10&10c
Clothes Line, Sargent's list...	60&10&10c
Clothes Line, Reading...	60&10&10c
Ceiling Sargent's list...	55&10&10c
Harness, Reading list...	55&10&55&10&10c
Coat and Hat, Sargent's list...	55&10&60&10c
Coat and Hat, Reading...	50&10&60&10&10c

**Wrought Iron—**

Cotton...	7/8 doz \$1.25
Cotton Pat. (N.Y. Mallet & Handle Wks.)...	50c
Tassel and Picture (T. & S. Mfg. Co.)...	50c
Wrought Staples, Hooks, &c...	See Wrought Goods.
Wire—	
Wire Coat and Hat, Gem, list April, 1880...	60c
Wire Coat and Hat, Miles, list April, 1880...	60c
Indestructible Coat and Hat...	45c
Wire Coat and Hat, Standard...	60c
Handy Hat and Coat...	50&10c
Steady Ceiling Hooks...	50&10c
Belt...	80&30&10c
Atlas, Coat and Hat...	60c
Bright Wire Goods, see Wire.	

**Miscellaneous.**

Grass, No. 2, \$2.00; No. 3, \$2.25; No. 4, \$2.50...	
Nolin's Grass...	7/8 doz \$2.25
Rush...	55&60c
Whitcomb's Patent...	55c
Hooks and Eyes—Malleable Iron...	70&70&10c
Hooks and Eyes—Brass...	60&10&10c
Fish Hooks, American...	50c
Bench Hooks...	See Bench Stops.

**Horse Nails—See Nails, Horse.****Horse Shoes—See Shoes, Horse.****Hose, Rubber—**

Competition...	75&75&5c
Standard...	60&10&5&60&10&10c
Extra...	60&10&60c
N. Y. B. & P. Co., Para...	25&25c
N. Y. B. & P. Co., Extra...	40&40&5c
N. Y. B. & P. Co., Dundee...	40&10 & 60c

**Huskies—**

Blair's Adjustable...	7/8 gr \$8.00
Blair's Adjustable Clipper...	7/8 gr 7.00
Hubbard's Solid Steel...	7/8 gr 4.50

**Indurated Fiber-Ware—See****Ware, Indurated Fiber.****Irons.**

From 4 to 10; at factory...	7/100 B.
Self-Heating...	\$2.30 to \$2.40
Self-Heating, Tailors'...	7/8 doz \$9.00 net
Mrs. Pott's Irons...	60&60&10c
Enterprise Star Irons...	60&60&10c
XX Cold Handle Rod Iron...	60&5&60c
Salamanca Irons...	25c
B. B. Sad Irons, 7/8 doz...	3&35c
Combined Fluter and Sad Iron, 7/8 doz...	15c
Fox Reversible, Self-Fluter 7/8 doz \$24.00...	
Chinese Laundry (N.E. Butt Co.) 8 1/2, 15c...	
New England...	5c, 15c
Mahony's Troy Pol. Irons...	25c
Sensible, list Jan. 91...	50&10&5c
Sensible Tailor's Irons...	35c
National Self-Heating...	30c

**Soldering—**

Soldering Coppers...	7/8 doz \$2.25
Cover's Adjustable, list Jan. 1 1886...	45&25c

**Irons, Pinking, per doz., 65¢.****Jack Screws—See Screws.****Jacks, Wagon.**

Daily...	40c
Victor...	40c
Lockport...	40c

**Kettles—**

Brass, Spun, Plain, list Jan. 1, '91, 25&5c	
Brass, Spun, Pld. W.M. list Jan. 1, '91, 25c	
Enameled and Tea—See Hollow Ware.	

**Keys—**

Lock Ass'n list Dec. 30, 1886...	50&10c
Eagle, Cabinet, &c...	33&25c
Hotchkiss' Brass Blanks...	40c
Hotchkiss, Copper and Tinned...	40c
Hotchkiss' Pad, and Cab...	25c
Ratchet Bed Keys...	7/8 doz \$4.00, 15c
Wollensak Tinned...	50&10c

**Knife Sharpeners—See Sharpeners, Knife.****Knives.**

Butcher, Shoe, &c—	
Wilson's Butcher Knives, list Dec. 8, 1890...	25c
Ames' Butcher Knives...	25c
Porter Bros' Butcher, &c...	40c
Jordan's A.A.I. Butchers' list...	25c
Butcher Knives...	40&10c
W. W. Wilson, Butcher, 6 in, \$2.00; 7 in, \$2.70; 8 in, \$3.80, &c...	
Ames' Shoe Knives...	20&25c
Ames' Bread Knives, 7/8 doz \$1.50, 15c...	
Moran's Shoe and Bread...	20c
Hay and Straw...	See Hay Knives.
Table and Pocket...	See Cutlery.
Corn, Auburn Mfg. Co. Western Pat...	7/8 doz \$3.00
Corn...	
Bradley's...	10c
Wadsworth's...	25c

**Drawing—**

Witherby...	
P. S. & W...	7/8 doz \$7.50 & 10c
Mix...	7/8 doz \$7.50 & 10c
New Haven...	60&10&60&10&5c
Merrill...	75&75&5c
Douglas...	15&10&25c
Watrous...	20&25c
L. & J. White...	20&25c
Bradley's...	25c
Adjustable Handle...	25&35c
Wilkinson's Folding...	25&25&5c

**Hay and Straw—**

Lightning, from jobbers...	\$8.00 & \$9.00
Wadsworth's...	40&75&40&10c
Carters' Needle...	7/8 doz \$11.00, \$11.50
Heath's...	7/8 doz \$13.00, \$13.50
Auburn Hay, Com. and Spear Point...	60c
Auburn, Straw...	60c
Nolin's Hay...	7/8 doz \$7.00 & \$8.00

**Mining.**

Am. Gold quality, 7/8 gr, 1 blade, \$7; 2 blades, \$12; 3 blades, \$18...	
Lothrop...	7/8 doz \$10.00, \$11.00
Smith's, 7/8 doz, Single, \$2.00; Double, \$3.40...	
Knapp & Cowles...	50&10&60c
Buffalo Adjustable...	7/8 doz \$3.00, 25c
Buffalo Double Adj'table...	7/8 doz \$3.00, 25c

**Knobs—**

Door Mineral...	60&65c
Door Por, Jap'd...	70&75c
Door Por, Nickel...	\$2.00 to \$2.25
Door Por, Plated, Nickel...	\$2.00 to \$2.25
Drawer, Porcelain...	60&10&60&10&10c
Hemacite Door Knobs...	40&10&50c
Yale & Towne Wood, list Dec, 1885...	40c
Furniture, Plain...	75c gr 80c, 60&10c
Furniture, Wood Screws...	25&10c
Base, Rubber Tip...	70&10&25c
Picture, Judd's...	60&10&10&70c
Picture, Sargent's...	70&10c
Picture, Hemacite...	35&5c
Shutter, Porcelain...	65&10c
Carriage's Jap...	7/8 gr 80c, 60&10c
Bardsley's Wood Door, Shutter, &c...	40c

**Ladies—**

Melting, Sargent's...	55&10c
Melting, Reading...	35&10c
Melting, Monroe's Pat...	7/8 doz \$4.00, 40c
Melting, P. S. & W...	35&10&40c
Melting, Warner's...	30c

**Lanterns—**

Plain with Guards, 7/8 doz...	\$3.75 to \$4.00
Square Plain, with Guards...	\$4.00 to \$4.25
Sq. Lift Wire, with Guards...	\$4.50
Police Lanterns (including packages).	
3 1/2-inch Bull's-eye Police regular...	7/8 doz \$3.60
3 1/2-inch Bull's-eye Police regular...	7/8 doz \$3.90
3 1/2-inch Bull's-eye Police flash light...	7/8 doz \$4.00
3 1/2-inch Bull's-eye Police flash light...	7/8 doz \$4.50

**Lawn Mowers—See Mowers, Lawn.****Leaders, Cattle.**

Humason, Beckley & Co.'s...	70c
Sargent's...	60&10c
Hotchkiss...	30c
Peck, Stow & W. Co.	60&10c

**Lemon Squeezers—See Squeezers, Lemon.****Lifters, Transom.**

Wollensak's:	
Class 3 and 4, Bronzed Iron...	50c
Class 3 and 4, Bronze Metal...	25c
Class 3 and 4, Brass...	25c
Skylight Lifters...	25c
Crown, list Feb. 20, 1891...	60c
Bronzed Iron Rods...	50&10&10&25c
Brass, Real Bronze or Nickel Plate...	30c
Excelior...	60&10&5c
Shaw's...	60&10c

**Lines—**

Cotton and Linen Fish, Draper's...	60c
Draper's and Tate's Chalk...	60c
Draper's Mason's Linen, 8 1/2 ft, No. 1...	\$1.25; No. 2, \$1.75; No. 3, \$2.25
\$2.75; No. 5, \$3.35...	
Cotton Chalk...	25c
Samson Cotton, No. 4, \$2; No. 4 1/2, \$2.50...	
Silver Lake, Braided, No. 0, \$6.00; No. 1, \$6.50; No. 2, \$7.00; No. 3, \$7.50...	
Mason's Linen, No. 3 1/2, \$1.50; No. 4, \$2.00; No. 4 1/2, \$2.50...	

Mason's Colored Cotton...	45c
Wire Clothes, Nos. 12, 14, 20...	10



<b>Hack Saws—</b>	
Griffin's, complete.....	40¢10¢50¢
Griffin's Hack Saw, Blades.....	40¢10¢50¢
Star Hack Saws and Blades.....	25¢
Eureka and Crescent.....	25¢
<b>Scrolls—</b>	
Lester, complete, \$10.00.....	25¢
Rogers, complete, \$4.00.....	25¢
Barnes' Builders' and Cab. Makers'.....	15¢35¢
Barnes' Scroll Saw Blades.....	25¢
<b>Saw Frames—See Frames, Saw.</b>	
<b>Saw Sets—See Sets, Saw.</b>	
<b>Saw Tools—See Tools, Saw.</b>	
<b>Scales—</b>	
Hatch, Counter, No. 171, good quality.....	75¢
Hatch, Tea, No. 161.....	75¢
Union Platform, Plain.....	25¢10¢20¢
Union Platform, Striped.....	25¢10¢20¢
Chattillon's Grocers' Trip Scales.....	50¢
Chattillon's Eureka.....	25¢
Chattillon's Favorite.....	40¢
Family Turnbills.....	30¢50¢10¢
Riehle Bros.' Platform.....	40¢
<b>Scale Beams—See Beams, Scale.</b>	
<b>Scissors, Fluting.....</b>	
<b>Scrapers—</b>	
Adjustable Box Scraper (S. R. & L. Co.).....	50¢10¢
Box, 1 Handle.....	75¢
Box, 2 Handle.....	75¢
Defiance Box and Ship.....	30¢10¢
Foot.....	50¢10¢50¢
Ship, Common.....	75¢
Ship, R. I. Tool Co.....	10¢
<b>Screen Window and Door Frames—See Frames.</b>	
<b>Screw Drivers—See Drivers, Screw.</b>	
<b>Screws.</b>	
<b>Bench and Hand—</b>	
Bench, Iron.....	55¢10¢55¢10¢10¢
Bench, Wood, Beech.....	75¢
Bench, Wood, Hickory.....	75¢
Hand, Wood.....	25¢10¢25¢10¢5¢
Hand, Grand Rapids, list.....	55¢
Lag, Blunt Point, list Jan. 1, 1890.....	75¢10¢
Coach and Lag, Gimlet Point, list Jan. 1, 1890.....	75¢10¢
Bed.....	25¢5¢
Hand Rail, Beech.....	75¢
Hand Rail, H. & P. Mfg. Co.....	70¢10¢75¢
Hand Rail, Am. Screw Co.....	75¢
Jack Screws, Millers Falls list.....	50¢50¢5¢
Jack Screws, P. S. & W.....	35¢
Jack Screws, Sargent.....	60¢10¢60¢10¢5¢
Jack Screws, Stearns.....	40¢40¢10¢
<b>Corb—</b>	
Humason & Beckley Mfg. Co.....	40¢10¢50¢
Williamson's.....	35¢40¢35¢25¢
Howe Bros. & Hulbert.....	50¢
<b>Machine—</b>	
Flat Head, Iron.....	55¢
Round Head, Iron.....	50¢
<b>Wood—</b>	
<b>List January 1, 1891.</b>	
Flat Head Iron.....	72¢10¢
Round Head Iron.....	67¢10¢
Flat Head Brass.....	72¢10¢
Round Head Brass.....	65¢
Flat Head Bronze.....	72¢10¢
Round Head Bronze.....	65¢
Borers' Drive Screws.....	83¢10¢
<b>Scroll Saws—See Saws, Scroll.</b>	
<b>Scythes.</b>	
Grain.....	40¢5¢40¢10¢
Grass.....	40¢10¢50¢
<b>Scythe Snaths—See Snaths, Scythe.</b>	
<b>Set.</b>	
<b>Set and Tool.</b>	
Alken's Sets, Avils and Tools.....	55¢10¢
Frays' Adj. Tool Hds., No. 1, 112, 2, 118, 3, 112, 4, 80.....	25¢35¢10¢
Miller's Falls Adj. Tool Hds.....	25¢
No. 1, 112, 2, 118.....	25¢
Henry's Combination Haft.....	25¢
Stanley's Excelsior.....	25¢
No. 1, 75.50; No. 2, 54.00; No. 3, 45.50.....	30¢10¢
Common 1 Grad Sets.....	30¢10¢
No. 42, 110.50; No. 43, 112.50.....	70¢10¢25¢
<b>Set—</b>	
Square.....	75¢
Round.....	75¢
Buck Bros.....	37¢10¢
Cannon's Diamond Point.....	75¢
<b>Shovel.</b>	
Regular list.....	50¢10¢
<b>Saw—</b>	
Stillman's Genuine.....	75¢
Stillman's Imita.....	35¢25¢40¢35¢
Common Lever.....	75¢
Morrill's No. 1, 115.00; No. 2, 112.50.....	35¢40¢
Leach's, No. 0, 93.00; No. 1, 115, 105.00.....	35¢40¢
Nash's.....	35¢40¢
Hammer, Hotchkiss.....	35¢40¢
Hammer, Bents & Call Co's new Pat.....	35¢40¢
Bemis & Call Co's Lever and Spring Hammer.....	35¢40¢
Bemis & Call Co's Plate.....	10¢
Bemis & Call Co's Cross Cut.....	125¢
Alken's Genuine.....	113.00, 50¢10¢30¢
Alken's Imitation.....	75¢
Hart's Pat. Lever.....	20¢
Diston's Star.....	25¢
Leopold.....	40¢10¢50¢
Atkin's Lever.....	75¢
Atkin's Criterion.....	75¢
Croissant (Keller), No. 1, 115.00; No. 2, 94.00.....	40¢10¢
Avery's Saw Set and Punch.....	50¢
Chieftain Co's Superior.....	75¢
Chieftain Co's Royal.....	75¢
Crescent.....	75¢
<b>Sharpeners, Knife.</b>	
Parkins.....	40¢
Applewood Handles.....	75¢
Rosewood or Cocobolo.....	40¢
<b>Shaves, Spoke</b>	
Iron.....	45¢
Wood.....	50¢
Bailey's (Stanley B. & L. Co.).....	40¢10¢
Stearns.....	30¢10¢
Cincinnati.....	35¢10¢
Goodell's, 75¢10¢.....	25¢
<b>Shears—</b>	
American (Cast) Iron.....	75¢10¢75¢10¢5¢
Barnard's Lamp Trimmers.....	75¢
Tinners'.....	20¢25¢
Seymour's, List, Dec. 1881.....	60¢10¢10¢60¢10¢10¢5¢
Heinisch's, List, Dec. 1881.....	60¢10¢10¢60¢10¢10¢5¢
Heinisch's Tailor's Shears.....	25¢45¢
Cast Steel Trimmers.....	25¢45¢
First quality.....	80¢10¢80¢10¢10¢
Second quality.....	80¢10¢80¢10¢10¢
Acme Cast Shears.....	10¢10¢
Diamond Cast Shears.....	10¢10¢
Clippers.....	10¢10¢
Victor Cast Shears.....	75¢10¢75¢10¢5¢
Howe Bros. & Hulbert, Solid Forged Steel.....	40¢
Chicago Drop Forge & F. Co., Solid Steel Forged.....	60¢
Davenport Cutlery Co.....	60¢60¢10¢
Claude Shear Co., Japaned.....	70¢
Claude Shear Co., Nickel, same list.....	60¢
Galvanic, 3/4 to 9 in., 75¢, 1.00 7/10 inch Pruning Shears and Hooks.....	45¢
Disston's Combined Pruning Hook and Saw.....	75¢
Disston's Pruning Hook.....	75¢
E. S. Lee & Co.'s Pruning Tools.....	40¢
Pruning Shears, Henry's Pat.....	75¢
Henry's Pruning Shears.....	75¢
Wheeler, M. & C. Co.'s Combination.....	75¢
Dunlap's Saw and Chisel.....	75¢
J. Mallinson & Co., No. 1, 45.25; No. 2, 7.25.....	75¢
P. S. & W. Co.....	60¢
<b>Tinners', etc.—</b>	
Shears and Snips (P. S. & W.).....	30¢35¢
Snips, J. Mallinson & Co.....	35¢45¢
<b>Sheaves—</b>	
<b>Sliding Door—</b>	
M. W. Co., list July, 1888.....	50¢10¢60¢5¢
R. & E., list Dec. 15, 1888.....	55¢20¢
Corbin's list.....	60¢10¢25¢
Patent Roller.....	60¢10¢25¢
Patent Roller, Haiden's.....	75¢
Russell's Anti-Friction, list Dec. 18, 1888.....	60¢25¢
Moore's Anti-Friction.....	50¢
<b>Sliding Shutter—</b>	
R. & E., list Dec. 15, 1888.....	60¢10¢25¢
Sargent's list.....	60¢10¢
Reading list.....	60¢10¢10¢
<b>Shells—</b>	
First quality 4, 8, 10 and 12 gauge.....	25¢10¢25¢
First quality, 14, 16 and 20 gauge (\$10 list).....	30¢10¢25¢
Price.....	40¢25¢
Star, Club, Rival and Climax brands.....	35¢10¢25¢
Solbold's Comb. Shot Shells.....	60¢25¢
Brass Shot Shells, list quality.....	60¢25¢
Brass Shot Shells, Club, Rival, Climax.....	65¢25¢
<b>Shells Loaded—</b>	
standard list, July 19, 1890.....	40¢10¢10¢40¢10¢10¢5¢
<b>Ship Tools—</b>	
L. & I. J. White.....	30¢25¢
<b>Shoes, Horse, Mule, &amp;c.—</b>	
<b>Horse—</b>	
Burden's, Perkins', Phoenix and Bryden's Boots, at factory.....	40¢
Bryden's Frog Pressure, at factory.....	50¢
<b>Mule—</b>	
Add \$1 1/2 keg to above prices.	
<b>Ox Wrought—</b>	
Ton lots.....	75¢
1000 lb lots.....	75¢
500 lb lots.....	75¢
<b>Shot—</b>	
Drop, up to B, 25-b bag.....	1.42
Drop, up to F, 5-b bag.....	.35
Drop, B and larger, 25-b bag.....	1.67
Drop, B and larger 5-b bag.....	.40
Buck and Chilled, 25-b bag.....	1.67
Buck and Chilled, 5-b bag.....	.40
Dust Shot, 25-b bag.....	2.00
Dust Shot, 5-b bag.....	.45
<b>Shovels and Spades—</b>	
Ames' Shovels, Spades, &c., list Nov. 1, 1888.....	20¢
Norw.—Jobbers frequently give 5¢75¢ extra on above.....	
Griffith's Black Iron.....	50¢10¢
Griffith's C. S.....	60¢60¢10¢
Griffith's Solid C. S. B. R. Goods.....	20¢
Hussey, Binns & Co.....	15¢25¢
Hubbard & Co.....	30¢30¢75¢
Lehigh Mfg. Co.....	50¢10¢
H. M. Myers Co.....	30¢
Payne Pettebake & Son.....	35¢25¢
Remington's (Lowman's) Pat.....	30¢10¢40¢
Rowland's Black Iron.....	50¢10¢
Rowland's Steel.....	60¢5¢60¢10¢
<b>Shovels and Tongs—</b>	
Iron Head.....	60¢10¢60¢10¢25¢
Brass Head.....	60¢10¢10¢
<b>Sieves—</b>	
Mann's Tin Rim.....	50¢25¢
Buffalo Metallic, S. B. & Co.....	50¢25¢
Shaker (Barber's Pat.) Flour Sifters.....	75¢
Electric.....	75¢
A. & W. Sifters.....	75¢
Hunter's.....	75¢
Smith's Adjustable Sifters.....	75¢
Smith's Adjustable Milk Strainer.....	75¢
Smith's Adjustable T. & C. Strainer.....	75¢
<b>Sieves, Wooden Rim—</b>	
Mesh 18, Nested, 75¢.....	80¢
Mesh 20, Nested, 75¢.....	95¢
Mesh 24, Nested, 75¢.....	1.15
Iron. Plated.....	1.10
Steel.....	1.25
<b>Skins, Thimble—</b>	
Western list.....	75¢5¢75¢10¢
Columbus Wrt. Steel, Special net prices.....	
Cokebrookdale Iron Co.....	60¢
Bonessa Falls Pattern.....	60¢
Utica P. & T. Skins.....	60¢
Utica Turned and Fitted.....	35¢
<b>Snaps, Harness, &amp;c.—</b>	
School, by case.....	50¢10¢50¢10¢10¢
Anchor (T. & S. Mfg. Co.).....	65¢
Fitch's (Bristol).....	50¢10¢
Hotchkiss.....	10¢
Andrews.....	50¢
Sargent's Patent Guarded.....	70¢10¢10¢
German, new list.....	40¢10¢
Covert.....	50¢10¢5¢25¢
Covert, New Patent.....	50¢10¢5¢25¢
Covert, New R. E.....	50¢10¢5¢25¢
Covered Spring.....	60¢10¢10¢
<b>Snaths, Scythe.</b>	
List.....	50¢
<b>Soldering Irons—See Irons, Soldering.</b>	
<b>Spittoons, Cuspiders, &amp;c.—</b>	
Standard Fiberglass.....	
Cuspiders, 5 1/2-inch, 75¢.....	No. 5, 85¢
Spittoons, Daisy, 8-inch, No. 1, 75¢; 10 and 11 inch, 85¢.....	
<b>Spoke Shaves—See Shaves, Spoke.</b>	
<b>Spoke Trimmers—See Trimmers, Spoke.</b>	
<b>Spoons and Forks—</b>	
<b>Tinned Iron—</b>	
Basting, Cen. Stamp. Co's list.....	70¢10¢
Solid Table and Tea, Cen. Stamp. Co's list.....	70¢10¢
Buffalo S. S. & Co.....	35¢45¢
<b>Silver-Plated—(4 mos. or 5¢ cash 30 days.)</b>	
Meriden Brit. Co., Rogers.....	40¢15¢
C. Rogers & Bros.....	40¢15¢
Rogers & Bros.....	40¢15¢
Reed & Barton.....	40¢40¢25¢
Stimpson, Hall, Miller & Co.....	40, 15¢25¢
Roimes & Edwards Silver Co.....	40, 15¢25¢
L. Boardman & Son.....	50¢125¢
<b>Miscellaneous.</b>	
Holmes & Edwards Silver Co.:.....	
No. 67 Mexican Silver.....	50¢10¢25¢
No. 30 Silver Metal.....	50¢10¢25¢
No. 24 German Silver.....	50¢10¢25¢
No. 60 Nickel Silver.....	50¢25¢
No. 49 Nickel Silver.....	50¢10¢25¢
Wm. Rogers Mfg. Co.....	50, 10¢25¢
Rogers' Silver Metal.....	50, 10¢25¢
1891 Rogers' German Silver.....	50¢25¢
22% Rogers' Nickel Silver.....	50¢25¢
German Silver, Hall & Elton.....	50¢25¢ cash
Nickel Silver.....	50¢25¢ cash
Britannia.....	60¢60¢25¢
Boardman's N'ck'l Silver, list July 1, 1891.....	60¢25¢ cash
Boardman's Britannia spoons, cash lots.....	60¢25¢ cash
<b>Springs—</b>	
<b>Door—</b>	
Torrey's Rod, regular size.....	75¢
Gr. P. gr. \$20.00.....	30¢
Bee Rod gr. \$20.00.....	30¢
Warner's No. 1, 75¢, 85¢; No. 2, \$3.30.....	40¢10¢50¢
Gem (Coll), list April 19, 1886.....	10¢
Star (Coll), list April 19, 1886.....	20¢
Victor (Coll).....	60¢60¢10¢
Champion (Coll).....	60¢60¢10¢
Covell's No. 1, 75¢, 85¢; No. 2, \$15.00.....	50¢
Rubber, complete, 75¢, \$4.50.....	55¢10¢
Hercules.....	50¢
Shaw Door Check and Spring.....	25¢50¢35¢
<b>Carriage, Wagon, &amp;c.—</b>	
Elliptic, Concord, Platform and Half Scroll.....	60¢10¢10¢
Cliff's Bolster Springs.....	25¢
<b>Squares—</b>	
Steel and Iron.....	80¢10¢80¢10¢10¢
Nickel-Plated.....	80¢10¢80¢10¢10¢
Try Square and T Bevels.....	80¢10¢40¢10¢
Diaston's Try Square and T Bevels.....	50¢
Winterbottom's Try and Miter.....	30¢10¢
Starrett's Micrometer Caliper Squares.....	25¢
Avery's Flush Bevel Squares.....	40¢
Avery's Bevel Protractor.....	50¢
<b>Squeezers.</b>	
<b>Fodder—</b>	
Blair's.....	75¢
Blair's "Climax".....	75¢
<b>Lemon—</b>	
Porcelain Lined, No. 1.....	75¢
Wood, No. 2.....	75¢
Wood, Common.....	75¢
Dunlap's Improved.....	75¢
Sammis.....	75¢
\$18 7/10.....	25¢10¢
Jennings' Star.....	75¢
The Boss.....	75¢
Dean's, No. 1, 75¢; No. 2, 85¢; 3, \$1.50; Queen, \$2.50.....	
Little Giant.....	50¢60¢25¢
King.....	40¢25¢
Hotchkiss Straight Flash.....	75¢
Silver & Co. Glass.....	75¢
Manny Lemon Juice Extractor.....	75¢
Standard.....	75¢
Improved.....	75¢
<b>Standard Fiber Ware—See Ware, Standard Fiber.</b>	
<b>Staples.</b>	
<b>Blind—</b>	
Barbed, 1/2 in. and larger.....	75¢
Barbed, 3/4 in. and larger.....	75¢
Fence staples, Galvanized.....	75¢
Fence Staples, Plain.....	75¢
Steel.....	75¢
<b>Stocks and Dies—</b>	
<b>Blacksmith's</b>	
Waterford Goods.....	40¢40¢10¢
Butterfield's Goods.....	40¢40¢10¢
Lightning Screw Plate.....	25¢30¢
Rocco's New Screw Plates.....	25¢30¢
Reversible Hatchet.....	40¢
Gardner.....	25¢
<b>Steps, Bench.</b>	
Morrill's.....	75¢
Hotchkiss's.....	75¢
Weston's, No. 1, 110; No. 2, 10.25; 10.25.....	10¢
McGill's.....	10¢
Cincinnati.....	25¢10¢
<b>Stone—</b>	
Hindustan No. 1, 3¢; Axs, 3 1/2¢; Slips No. 1, 4 1/2¢.....	
Sand Stone.....	75¢
Washita Stone, Extra.....	75¢
Washita Stone, No. 1.....	75¢
Washita Stone, No. 2.....	75¢
Washita Slips, No. 1, Extra.....	75¢
Washita Slips, No. 1.....	75¢
Arkansas Stone, No. 1, 4 to 6 in.....	15¢
Arkansas Stone, No. 1, 6 to 9 in.....	15¢
Turkey Oil Stone, 4 to 8 in.....	75¢
Turkey Slips.....	75¢
Lake Superior Slips, Chase.....	75¢
Lake Superior Slips, Chase.....	75¢
Seneca Stone, Red Paper Brand.....	75¢
Seneca Stone, High Round.....	75¢
Seneca Stone, Small Whets.....	75¢
<b>Stove Polish—See Polish, Stove.</b>	
<b>Stretchers, Carpet.</b>	
Cast Iron, Steel Points.....	75¢
Socket.....	75¢
Gullard's.....	75¢
<b>Strops, Razor—</b>	



